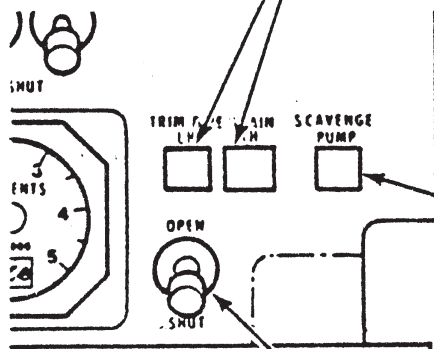


SCAVENGE AND TANK PRESSURE

TRIM PIPE DRAIN VALVE MIS

OPEN  SHUT



TRIM PIPE DRAIN SWITCH

OPEN - both trim pipe drain valves connect the main trim transfer pipes to the vent scavenge tank.

SCAVENGE PUMP MI

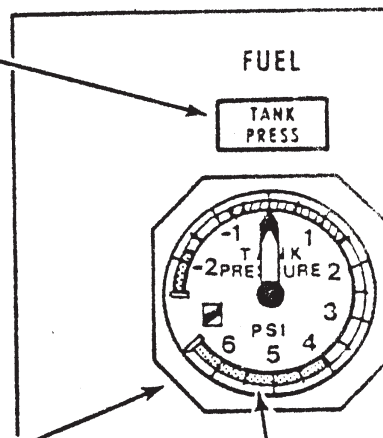
OFF

ON - indicates the pump is running. The scavenge pump removes any fuel that has entered the scavenge tank from the main tanks, through the vent system, and returns it to tank 3. Operation of the pump is automatic.

TANK PRESS LIGHT (Amber)

On - indicates one of three conditions:
The fuel vent gallery to atmosphere differential pressure is high and rising, or low and falling, or the vent gallery absolute pressure is below 2 psi at altitude.

Accompanied by the master warning FUEL light (amber) and audio (gong).



TANK PRESSURE GAUGE

Shows the pressure differential between the pressure in the right-hand vent gallery and static pressure.

A red and black flag in a window on the left-hand side of the gauge indicates a power loss or indication failure.

Two red secondary pointers remain at the maximum and minimum pressure difference attained during operation.

The secondary pointers are reset using the ENG LIMIT RESET push button.

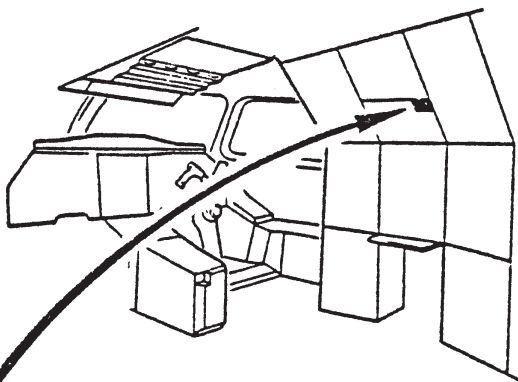
KEY:-

	AMBER
	GREEN
	YELLOW

JETTISON AND TEMPERATURE

COLLECTOR TANKS 1, 2, 3 and 4
JETTISON VALVE SWITCHES

OPEN - the collector tank jettison valves allow fuel to flow from the collector tanks into the trim transfer pipes. However, when the JETTISON MASTER VALVES are open the collector tank jettison valves will be signalled to close if the level falls to underfull.

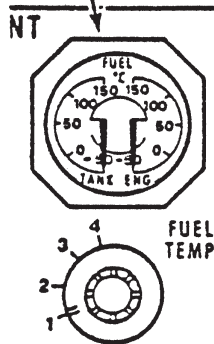


TRANSPARENT COVERS

The jettison panel transparent covers can only be closed when the collector tank jettison valve switches are at SHUT and the JETTISON MASTER VALVES switches are at OFF.

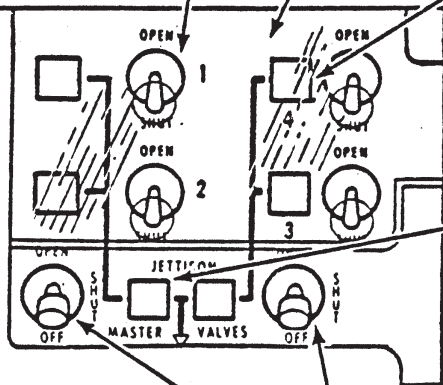
FUEL TEMPERATURE INDICATOR

Shows the temperature of the fuel in the selected engine feed system.
TANK - refers to upstream of airconditioning and hydraulic heat exchangers.
ENG - refers to downstream of the airconditioning and hydraulic heat exchangers.



FUEL TEMPERATURE ROTARY SELECTOR

Selects the fuel feed system to be observed by the temperature indicator. The numbered positions refer to the selected engine.

TANKS 1, 2, 3 and 4
JETTISON VALVE MIS.JETTISON MASTER VALVES
MI(2)JETTISON MASTER VALVE
SELECTOR

OPEN - opens the jettison master valves to allow fuel to flow overboard from the trim pipes at the tailcone.
SHUT - shuts the jettison master valves.
OFF - the jettison master valves are electrically isolated. If the selector is set to OFF before the valve is shut the valve will shut before the electric supply is isolated.

DE-AERATION AND LP PROTECTION

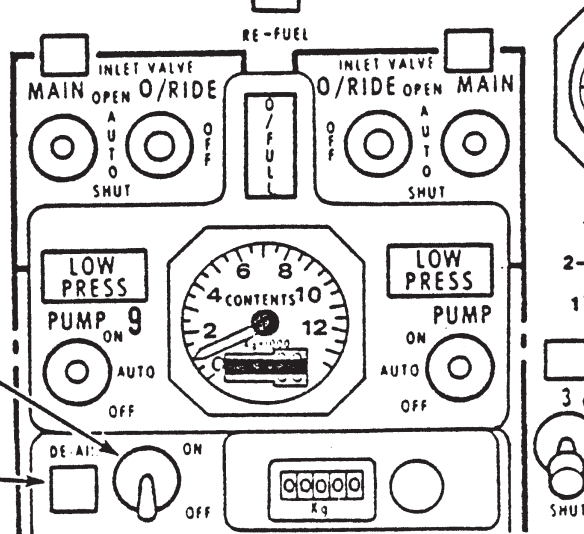
TANK 10 DE-AIR PUMP SWITCH

ON - the DE-AIR pump circulates fuel through spray nozzles in the tank thus ensuring de-aeration of the fuel.

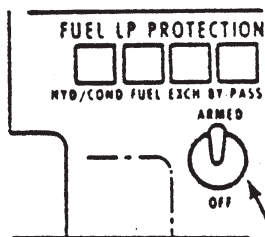
TANK 10 DE-AIR PUMP MI



FUEL MANAGEMENT

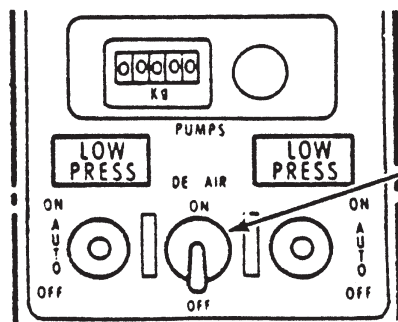
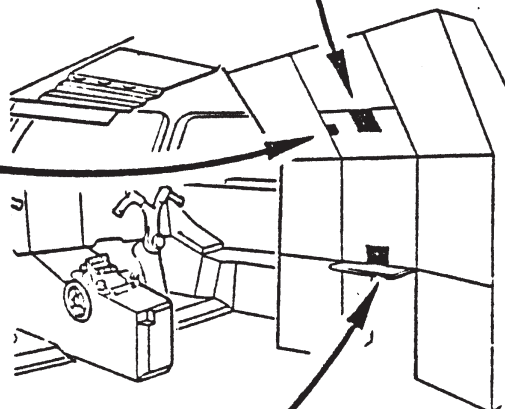


FUEL LP PROTECTION MI



FUEL LP PROTECTION SWITCH

ARMED - in the event of low fuel pressure in the engine feed supply, the by-pass valves will open and cause the fuel supply to the engine to by-pass the air conditioning and the hydraulic heat exchangers.



TANK 11 DE-AIR SWITCH (4)

The switch controls tank 11 left-hand electrical pump for de-aeration.

NOTE : With the left hand PUMPS selector at AUTO this switch is inhibited when the TRIM TRANS AUTO MASTER selector is set to REARWARD.

Chapter 12

**HYDRAULIC
POWER**

HYDRAULIC POWER

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Ram Air Turbine	12.02.04
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Hydraulic Management Panel	12.02.06
Controls and Indicators	
Hydraulic Management Panel (Sheet 1 of 3)	12.03.01
Hydraulic Management Panel (Sheet 2 of 3)	12.03.02
Hydraulic Management Panel (Sheet 3 of 3)	12.03.03
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GENERAL

Hydraulic power is provided by three independent systems. There are two main systems called Green and Blue and a standby system called Yellow. Each of these systems is powered by two engine-driven pumps.

Emergency power is provided by a ram air turbine.

DESCRIPTIONNormal and Standby

Normal and standby generation is provided by six engine-driven pumps. The two Green system pumps are driven by engines 1 and 2, the two Blue system pumps by engines 3 and 4 and the two Yellow system pumps by engines 2 and 4.

Normal pressure of the three hydraulic systems is 4000 psi and in case of overpressure a pressure limiter allows a maximum pressure of 4500 psi.

To prevent cavitation of the engine-driven hydraulic pumps the three reservoirs must be pressurized.

An auxiliary air compressor is provided to ensure that the three reservoirs are pressurized before engine start.

Emergency

Emergency generation is provided by a ram air turbine (RAT). The RAT is a two-bladed propellor which provides power to drive two hydraulic pumps in the event of the engine windmilling speed being insufficient to provide hydraulic and electrical power at subsonic speeds following a four-engine flame out.

Ground

Ground generation is provided by two electric pumps that can be selected to pressurize the main and standby systems while the aircraft is on the ground. The maximum delivery pressure and flow of the electrical pumps is less than that of the engine-driven pumps.

Green Hydraulic System

This system supplies power for normal operation of the following services:-

- Engines 1 and 2 air intake ramps and spill doors
- One ram of each power flight control
- One ram of each relay jack
- Artificial feel
- One tank 11 fuel pump
- Droop nose and visor
- Landing gear
- Main wheel brakes with anti-skid
- Nosewheel steering

(Unchanged)

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The Green system also supplies the Emergency Generator hydraulic motor.

Blue Hydraulic System

This system supplies power for normal operation of the following services:-

- Engine 3 and 4 air intake ramps and spill doors
- One ram of each power flight control
- One ram of each relay jack
- Artificial feel
- One tank 11 fuel pump

Yellow Hydraulic System

This system supplies power for standby operation of the following services:-

- Engine 1,2,3 and 4 air intake ramps and spill doors
- Flight controls
- Droop nose and visor lowering
- Landing gear lowering
- Main wheel brakes with anti-skid
- Emergency and parking brakes without anti-skid
- Nosewheel steering

Automatic Protection Following System Failure

In the event of low pressure or a tank low level in Green or Blue systems, a detection system automatically unloads the yellow system engine driven pumps and changes the hydraulic power supply for the appropriate ramp and spill door-actuators from Blue or Green system to Yellow.

In the event of a low level in the Yellow system reservoir, the first low level detection automatically inhibits the Yellow supply to:

- (a) Nosewheel steering.
- (b) Flying Controls.
- (c) In the case of a Yellow/Green selection the Yellow supply to main wheel brakes with anti-skid is cut off.

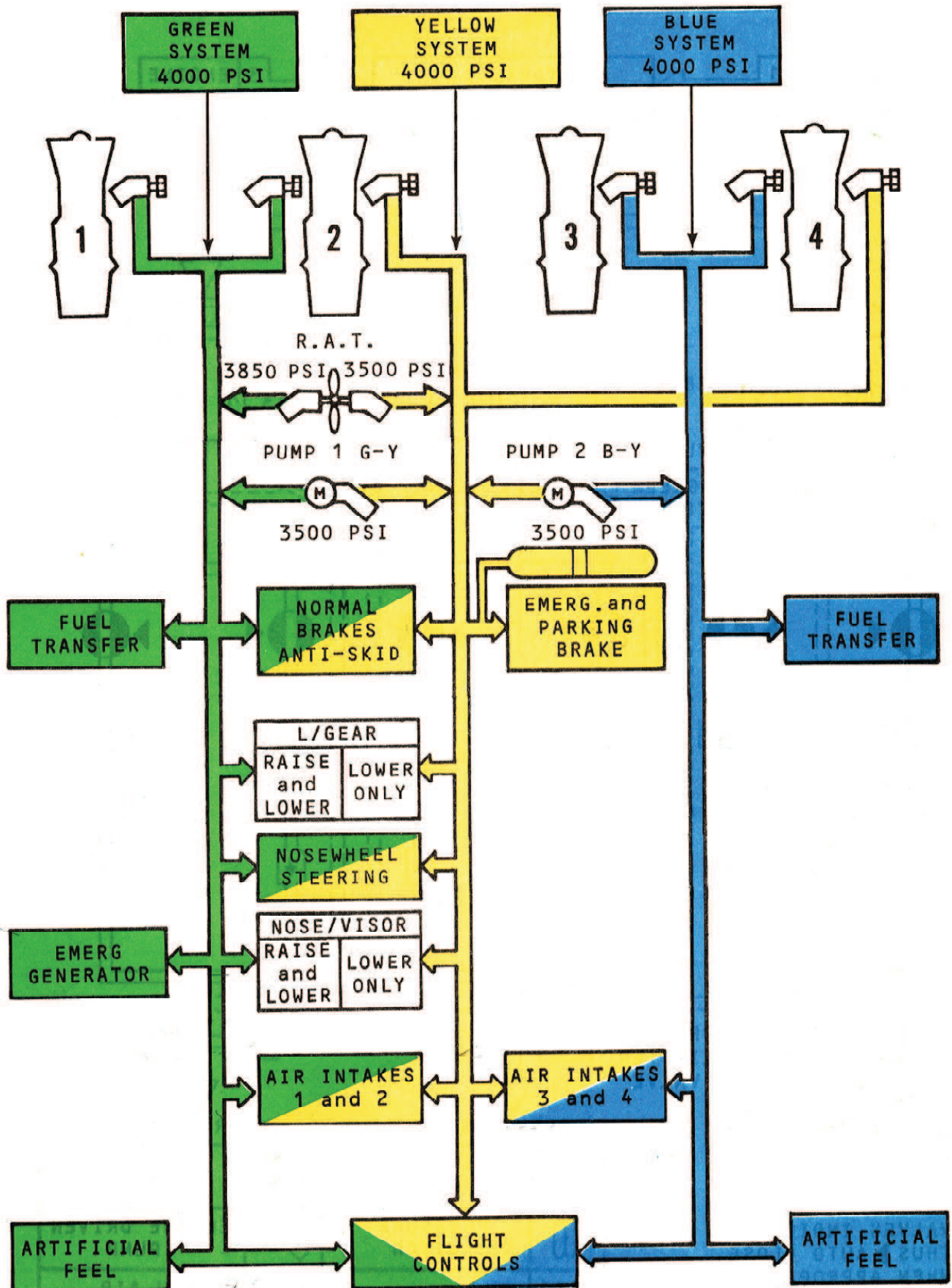
At a second low level, the Yellow supply to the intake spill doors is cut off but this is overridden during manual inching on Yellow.

If a first low level cut off of the selected yellow supply to flying controls occurs and a low pressure exists in the other side of flying controls, there is an automatic change of yellow supply to power the second failed flying control system.

If a GREEN ONLY or BLUE ONLY selection by the PFCU servo selector has been made and low pressure occurs in the selected system there is an automatic change to power the selected system with yellow system.

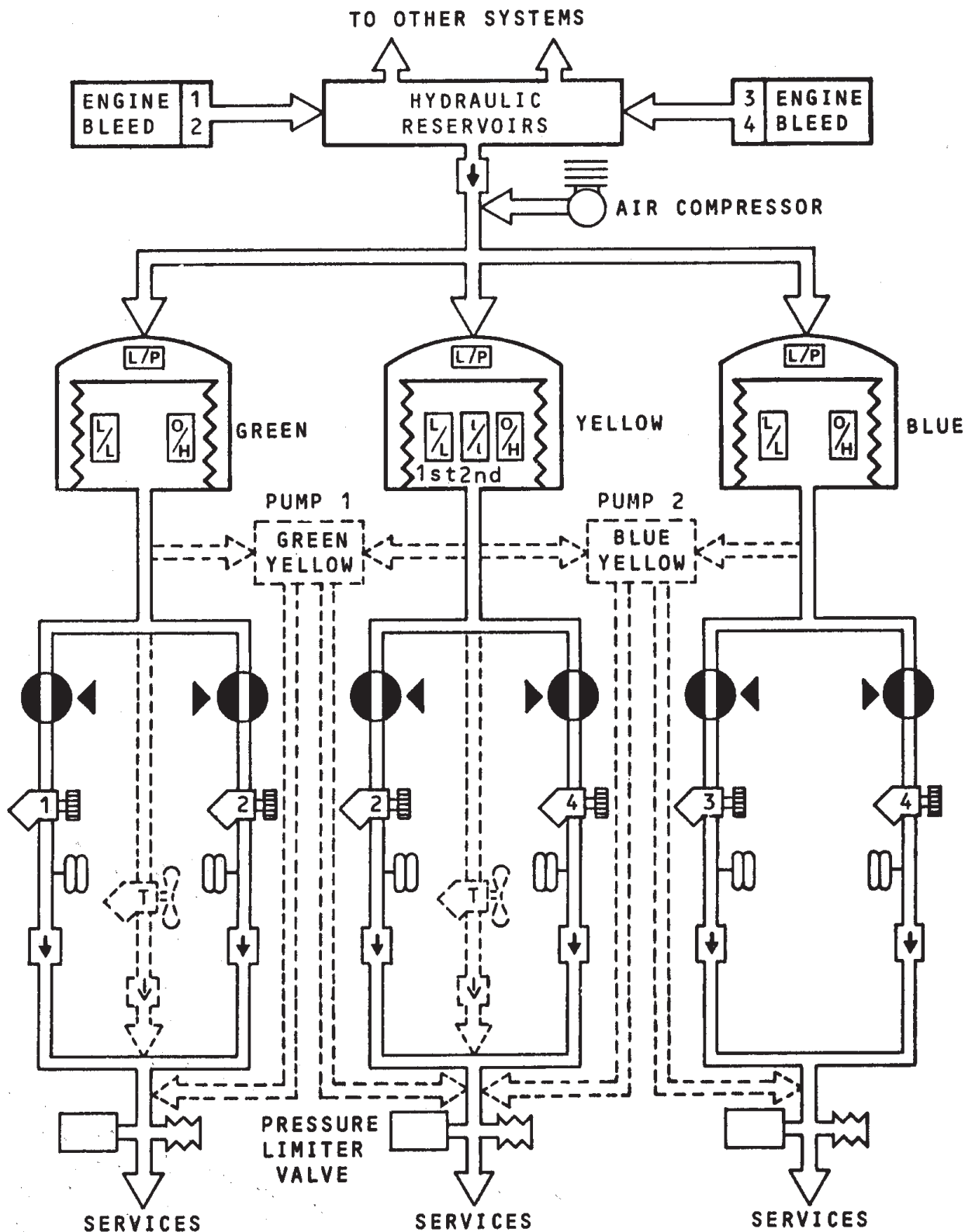
If the flying controls are being powered by a single main hydraulic system after yellow tanks low level cut-off, and transfer of fluid from the operating system to yellow tank causes both a low pressure in the operating system and yellow tanks contents to rise above the low level cut-off, it is a design feature that yellow system pressure will be supplied to both sides of the PFCUs.

DISTRIBUTION



12.02.02
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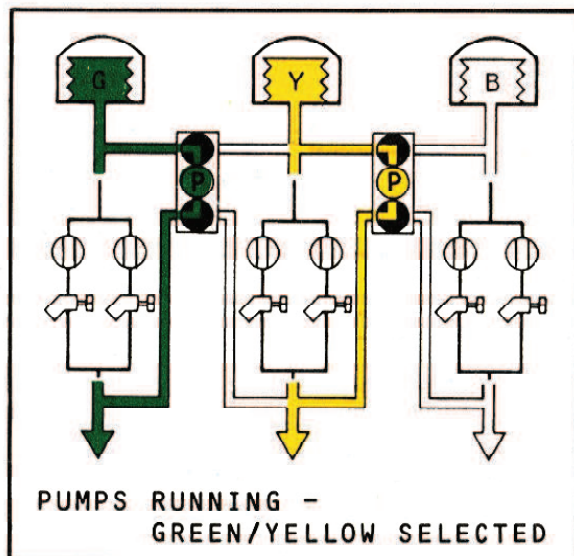
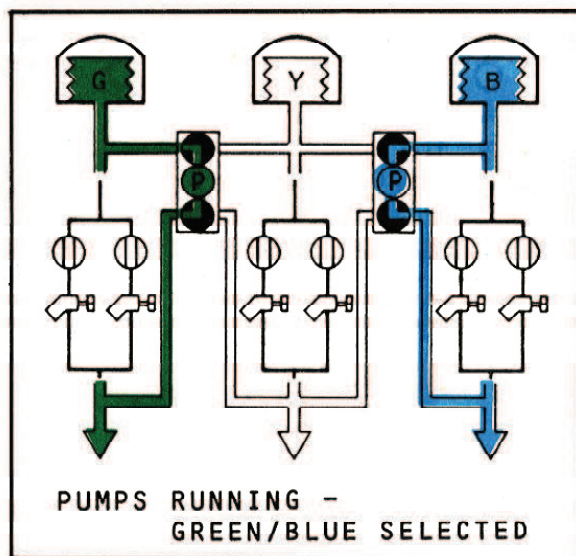
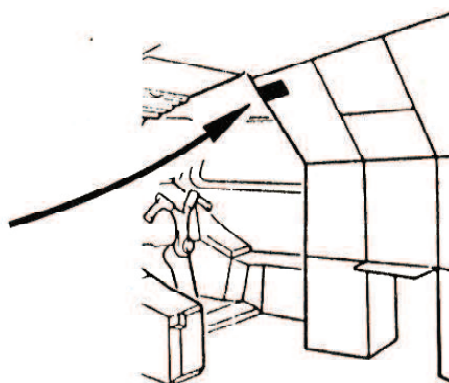
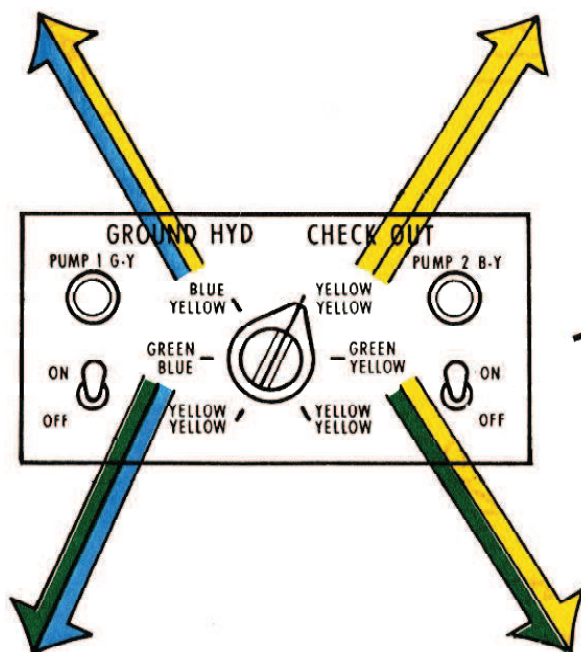
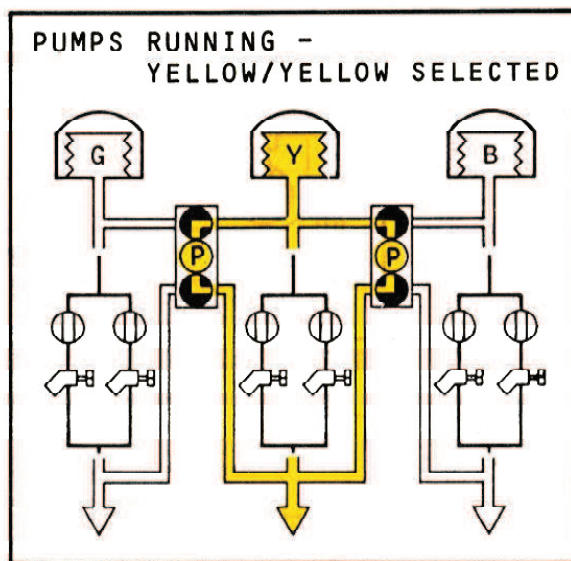
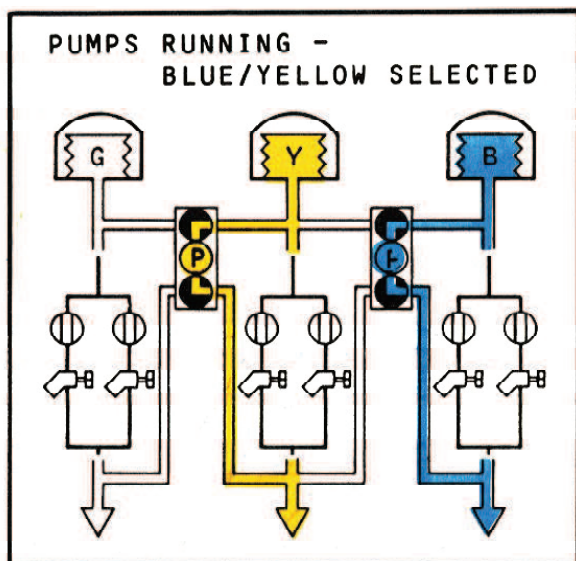
SYSTEM SCHEMATIC



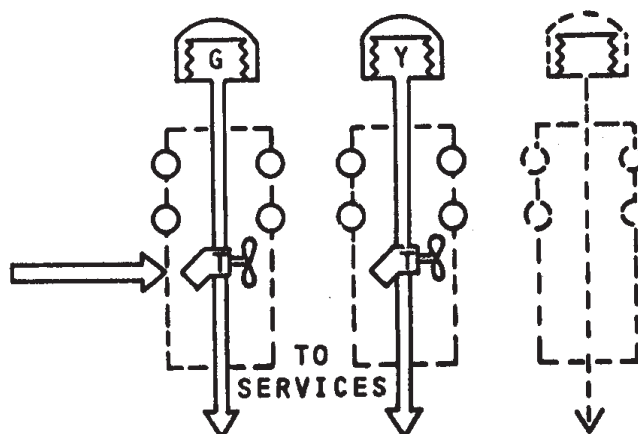
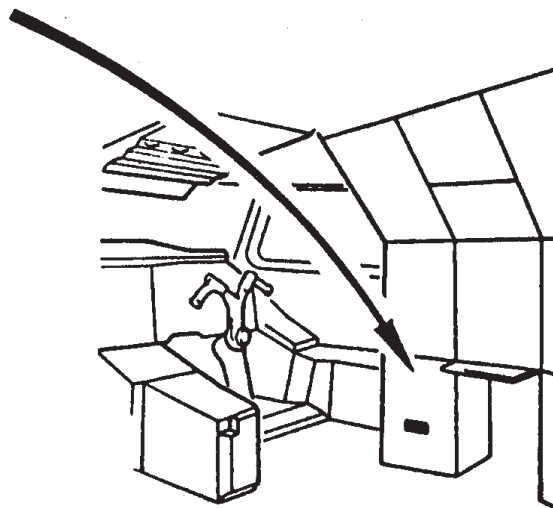
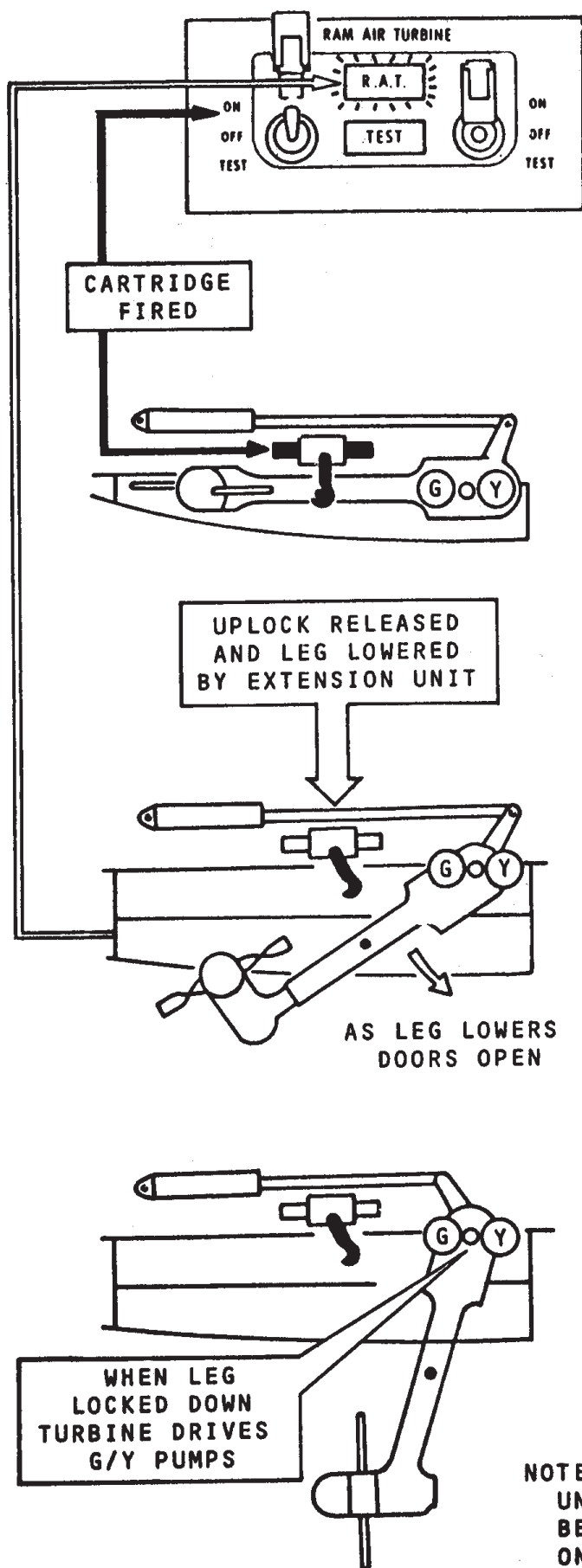
NOTE:
VALVES INDICATED
THUS ► AUTO CLOSE
WHEN APPROPRIATE
ENGINE SHUT-DOWN
HANDLE PULLED.

↓	NON RETURN VALVE	●	VALVE
— —	PRESSURE SWITCH	◀	ENGINE DRIVEN PUMP
⌋	PRESS TRANS	⌋	RAM AIR TURBINE PUMP

GROUND PUMPS

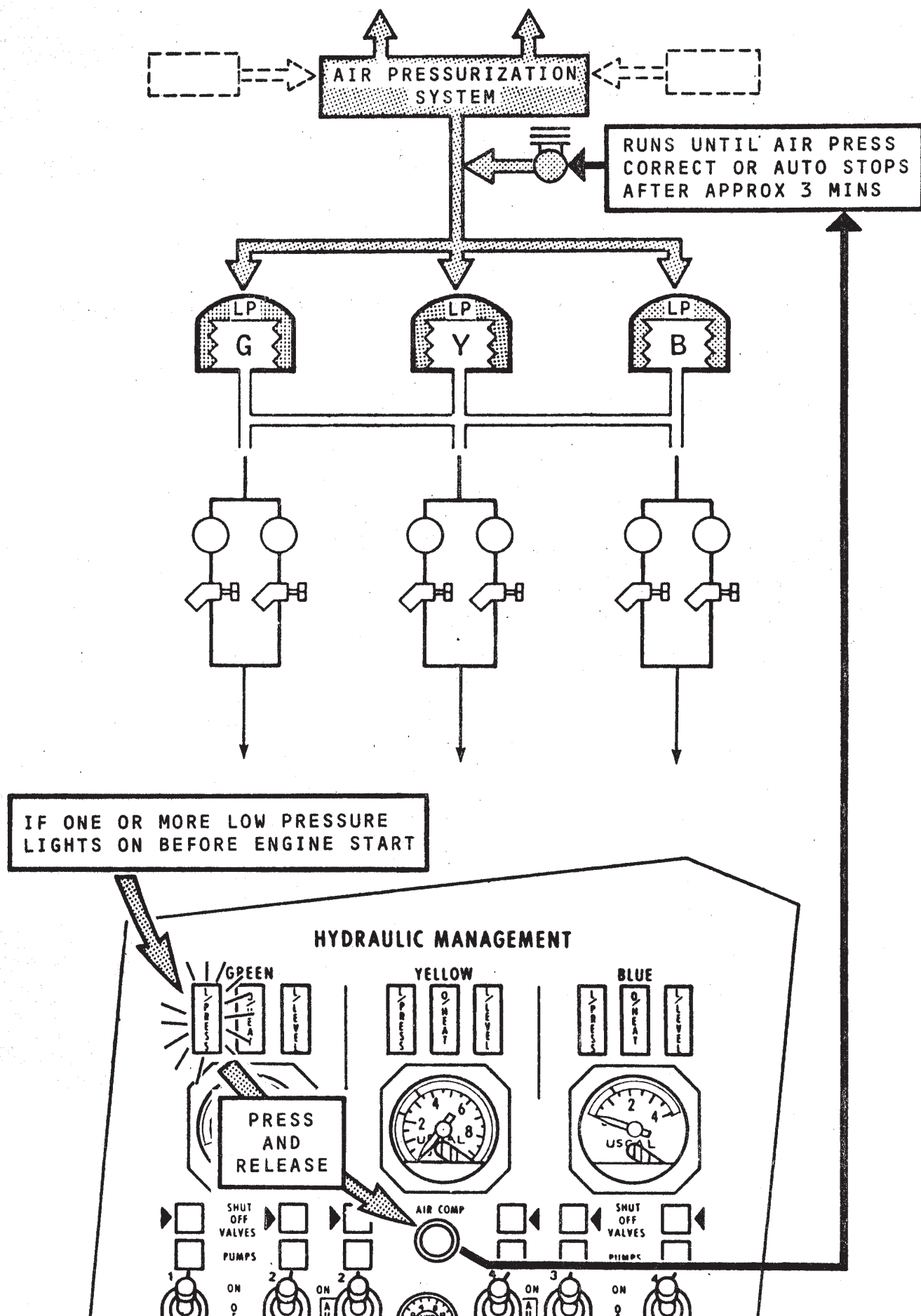


RAM AIR TURBINE

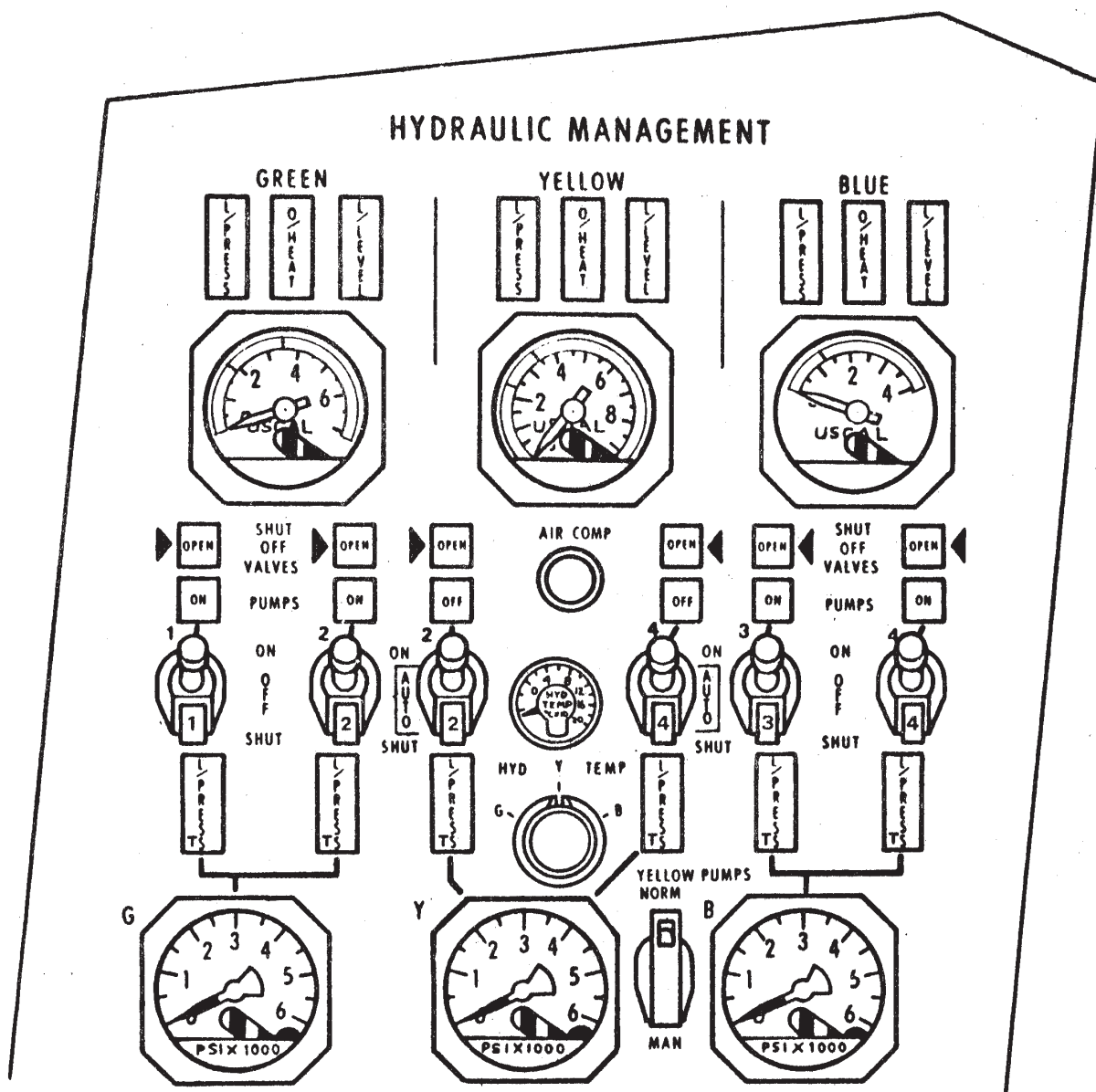


NOTE:
UNIT CAN ONLY
BE RESTOWED
ON GROUND

RESERVOIR PRESSURIZATION



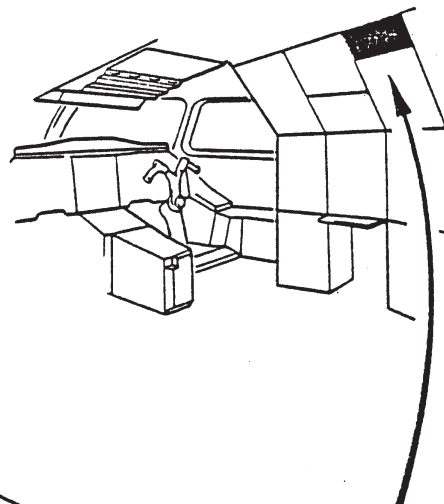
HYDRAULIC MANAGEMENT PANEL



HYDRAULIC MANAGEMENT PANEL
(Sheet 1 of 3)GREEN AND BLUE SYSTEM L/LEVEL LIGHT
(Amber) (2)

On - indicates that the hydraulic quantity has fallen to the red mark in the yellow band. Accompanied by MWS HYD light (amber) and audio (gong).

At the red mark in the yellow band the yellow hydraulic system engine driven pumps are unloaded and yellow system fluid is supplied directly to the intake spill door actuators and to the standby motors of the intake ramps. At the same time the main system fluid is isolated upstream of the spill door actuators and normal motors of the ramps.



HYDRAULIC MANAGEMENT

O/HEAT LIGHT (Amber) (3)

On - indicates that the fluid temperature exceeds 140 deg C. Accompanied by a MWS HYD light (amber) and audio (gong).

YELLOW SYSTEM L/LEVEL LIGHT (Amber)

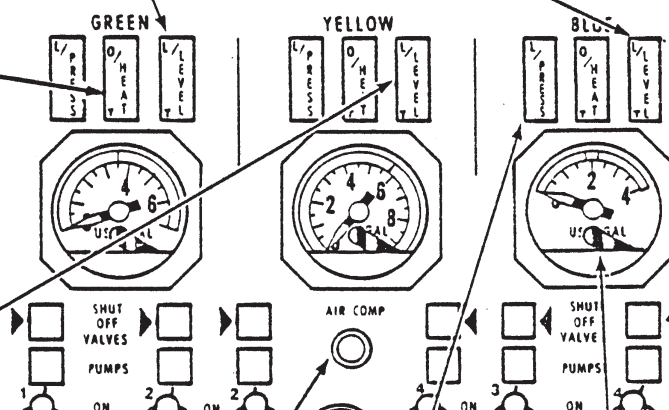
On - indicates that the hydraulic quantity has fallen to the first red mark in the yellow band. Accompanied by MWS HYD light (amber) and audio (gong).

At the first red mark in the yellow band i.e. first low level, the selection of the yellow system fluid to nosewheel steering, normal brakes and the selected flight control system is inhibited. If low pressure also exists in the non-selected flying control system, fluid is automatically supplied to it from the yellow system. At the second red mark in the yellow band i.e. second low level, the selection of the yellow system fluid to the intake spill doors actuators is inhibited.

AIR COMPRESSOR PUSH BUTTON

Pressed - starts the auxiliary air compressor; it will operate until either the reservoir pressure is sufficient or approximately 3 minutes have elapsed.

NOTE: Only used on the ground.



L/PRESS LIGHT (Yellow) (3)

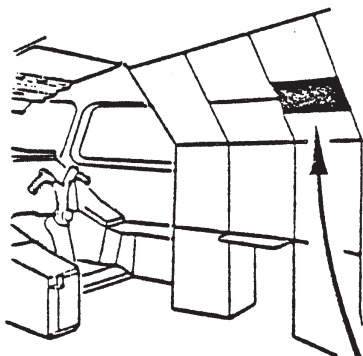
On - indicates a low air pressure in the hydraulic reservoir.

SYSTEM RESERVOIR CONTENTS GAUGE (3)

The correct fluid level, with the accumulators unpressurized and a fluid temperature of 20 deg C is shown by a white mark within the green band. The red mark within the yellow band shows the low level switching point. If the electrical supply to the gauge is interrupted a failure flag will be visible.

HYDRAULIC MANAGEMENT PANEL

(Sheet 2 of 3)

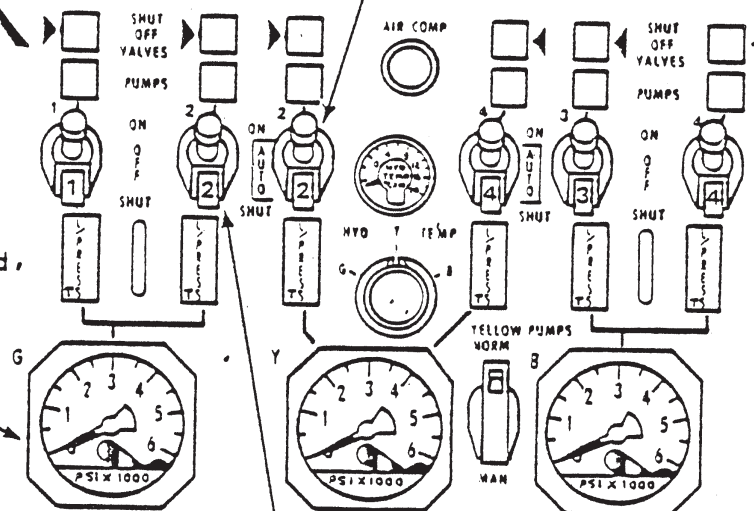


YELLOW SYSTEM

- ON - onloads the engine driven pumps.
- AUTO - offloads the engine driven pumps except when the landing gear lever is DOWN or when the yellow system is selected or required by other system failures.
- SHUT - the engine driven pumps shut-off valve is driven to SHUT and the pumps are offloaded. This position is guarded and wirelocked to prevent inadvertent operation.

HYDRAULIC PRESSURE GAUGE

If the electrical supply to the gauge is interrupted, a failure flag will be visible.



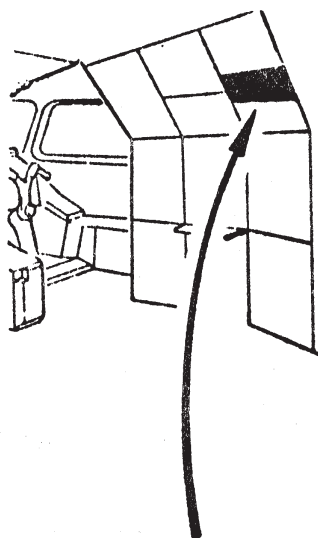
ENGINE DRIVEN HYDRAULIC PUMPS SELECTOR

The guard number identifies the engine which drives the pumps.

BLUE AND GREEN SYSTEM

- ON - onloads the engine driven pumps.
- OFF - offloads the engine driven pumps allowing only a small internal cooling/lubrication flow.
- SHUT - the engine driven pumps shut-off valve is driven to SHUT and the pumps are offloaded. This position is guarded and wirelocked to prevent inadvertent operation.

(Unchanged)



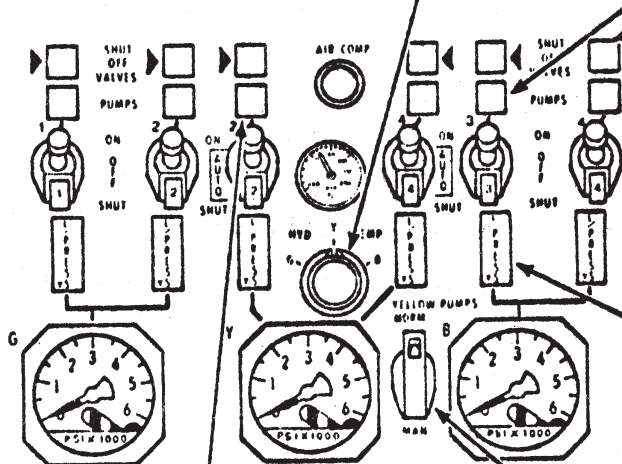
HYD TEMP shows the temperature of hydraulic fluid in the selected reservoir.

HYD TEMP ROTARY SELECTOR

- G - selects temperature gauge to green reservoir.
- Y - selects temperature gauge to yellow reservoir.
- B - selects temperature gauge to blue reservoir.

GREEN AND BLUE HYDRAULIC PUMPS MIS (4)

- ON** - Pump selector at ON, unloaded.
- OFF** - Pump selector at OFF or SHUT, offloaded.



SHUT OFF VALVE MIS (6)

- OPEN** - The shut off valves are controlled by the engine driven pumps selectors or by the engine shut down handle
- SHUT**

HYDRAULIC PUMP L/PRESS LIGHTS (Amber) (6)

- On - indicates a low pressure condition exists downstream of the engine driven pump. Accompanied by MWS HYD (Amber)
- Pressed - offloads the pump.

YELLOW HYDRAULIC PUMPS MIS(2)

- ON** - Pump selector at ON or Pump selector at AUTO when main system at low level or low pressure.
 - Any engine air intake selector at YELLOW.
 - Any engine shut down handle pulled.
 - Flight controls servo selector at YELLOW/BLUE or YELLOW/GREEN.
 - Nose/visor standby control in use
- or
- Landing gear selected down.
- OFF** - Pump selector at SHUT or Pump selector at AUTO when landing gear is up.

YELLOW PUMPS SWITCH

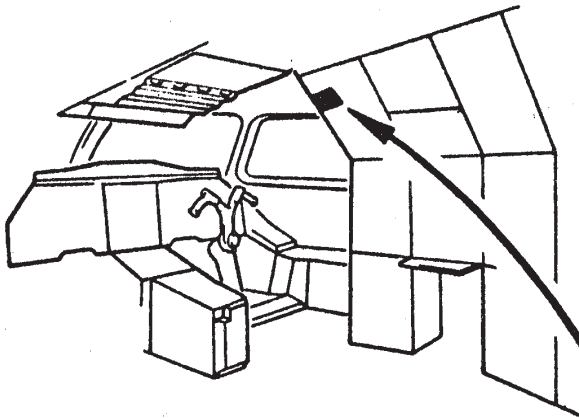
- NORM** - the yellow system engine driven pump AUTO function is armed.
- MAN** - the auto function of the yellow system engine driven pumps is inhibited and the AUTO position of the EDP selectors offloads the engine driven pumps.

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CONCORDE FLYING MANUAL

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GROUND HYDRAULIC CHECK OUT PANEL

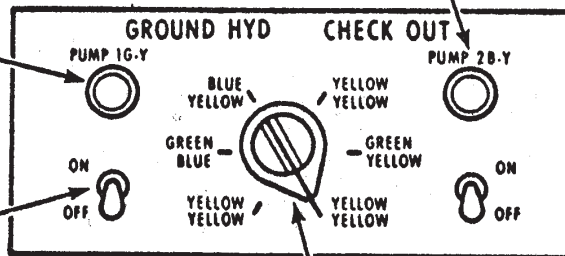


CIRCUIT BREAKER

For the protection of
pump 1G-Y.

CIRCUIT BREAKER

For the protection of
pump 2B-Y.



PUMP SWITCHES

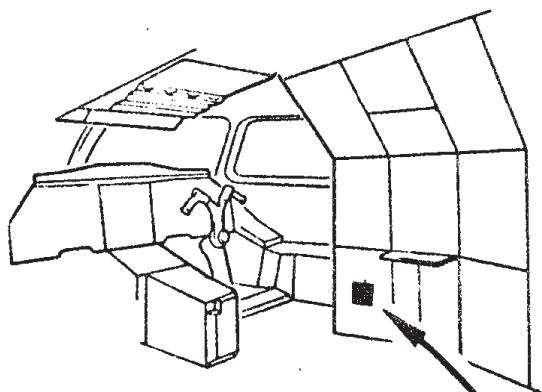
Are of the magnetic hold
type and go to the OFF
position when ground
power is disconnected.

ON - operates the electric
pumps and disconnects
the rear galley
electric supply.

GROUND HYDRAULICS CHECK OUT SELECTOR

- YELLOW YELLOW - both electric pumps are
supplying the yellow system.
- GREEN BLUE - the green system is
pressurized by PUMP 1G-Y
and the blue system by
PUMP 2B-Y.
- BLUE YELLOW - the blue system is
pressurized by PUMP 2B-Y
and the yellow system
by PUMP 1G-Y.
- GREEN YELLOW - the green system is
pressurized by PUMP 1G-Y
and the yellow system by
PUMP 2B-Y.

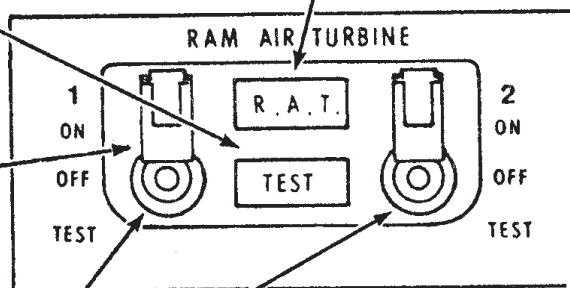
RAM AIR TURBINE



R.A.T. LIGHT (Green)
On - indicates that the
R.A.T. has deployed.

TEST LIGHT (Blue)
On - indicates a successful
test.

SELECTOR GUARD (Wirelocked)
Protects only the ON
position.



RAM AIR TURBINE SELECTORS

Each selector controls a separate and independent firing circuit.

ON - the cartridge detonates releasing the ram air turbine uplock allowing the ram air turbine to fall to its operating position.

At ON the standby inverter is supplied from DC essential busbar 3P and selected to power the standby instrument busbar 33X supplying No.1 radio altimeter and a 26V transformer which powers the standby instrument busbar 32X supplying the standby ASI and standby altimeter.

At ON, operation of the normal landing gear system is inhibited

The selector is spring returned from TEST to OFF position.

TEST - At TEST the standby inverter is checked and the continuity of the electrical firing circuit of the corresponding cartridge unit used to unlock the R.A.T. uplock.

Chapter 13

**ICE AND RAIN
PROTECTION**

ICE & RAIN PROTECTION

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Engine Anti-icing Control	13.02.04
Windshield and Visor De-icing and Rain Dispersal	13.02.05
ADS Probe Heating	13.02.06
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ADS and Engine Probe Heaters	13.03.07

ICE & RAIN PROTECTION

GENERAL

The ice and rain protection system comprises:-

- wing leading edge anti-icing
- intakes anti-icing
- engines anti-icing
- ADS and engine probe heaters
- flight compartment transparency anti-icing and demisting
- windshield rain dispersal
- ice detection system
- pressurisation/static heaters
- drain mast heaters

ICE DETECTION

Two independent and identical ice detection systems each provide a blue ICE warning light when icing conditions are detected. Either blue ICE light arms a red ICE light and the MWS red ICE light which are inhibited when the anti-icing is selected on.

WING AND INTAKE ANTI-ICING

The intake leading edges, rear ramp leading edges, spill doors, high speed air conditioning intakes, and the wing leading edges in front of the intakes and inboard to the fuselage, are de-iced by a combination of continuous and cyclic heating which prevents uncontrolled shedding of ice into the intakes.

The wing and intake anti-icing system is inhibited by weight switches while the aircraft is on the ground and by an ADC signal when the total air temperature is above plus 15 deg. C. The warning lights however are not inhibited.

Two independent control systems are provided, namely, main and alternate. A push button on the alternate system can be used to by-pass the above 'plus 15 deg. C.' inhibition.

ENGINE ANTI-ICING

The engine inlet guide vanes are protected by hot air tapped from the engine. The system can be operated either on the ground or in flight.

ADS AND ENGINE PROBE HEATING

The ADS and engine probe heating consists of the total air temperature heaters 'Tt', static sensor heaters 'S', sideslip sensor heaters 'B', angle of attack sensor heaters ' α ' which are inhibited when the total air temperature is above plus 15 deg. C, the pitot probe heater 'P', standby pitot probe heater 'STBY', and the engine intake temperature probe heaters T_1 .

ICE & RAIN PROTECTION

WINDSHIELD AND VISOR DE-ICING, SLIDING SIDE WINDOW (DV) DEMISTING

The transparency de-icing and demisting systems are automatically regulated by a normal control channel. If this channel fails, the temperature will be automatically regulated by a second channel operating at a higher temperature.

The windshield heaters have two heating levels, high and low. When high is selected the system will automatically change to the low condition if the visor is raised or if the aircraft is on the ground.

For emergency operation, the windshield de-icing can be selected to by-pass the heat control system and power directly the central part of the windshield at the high heating level.

The visor heater operates only when the visor is locked up.

RAIN DISPERSAL

The windshield wipers and deflectors and the rain repellant system are used in combination to ensure adequate visibility in all rain conditions.

PRESSURISATION STATIC HEATING

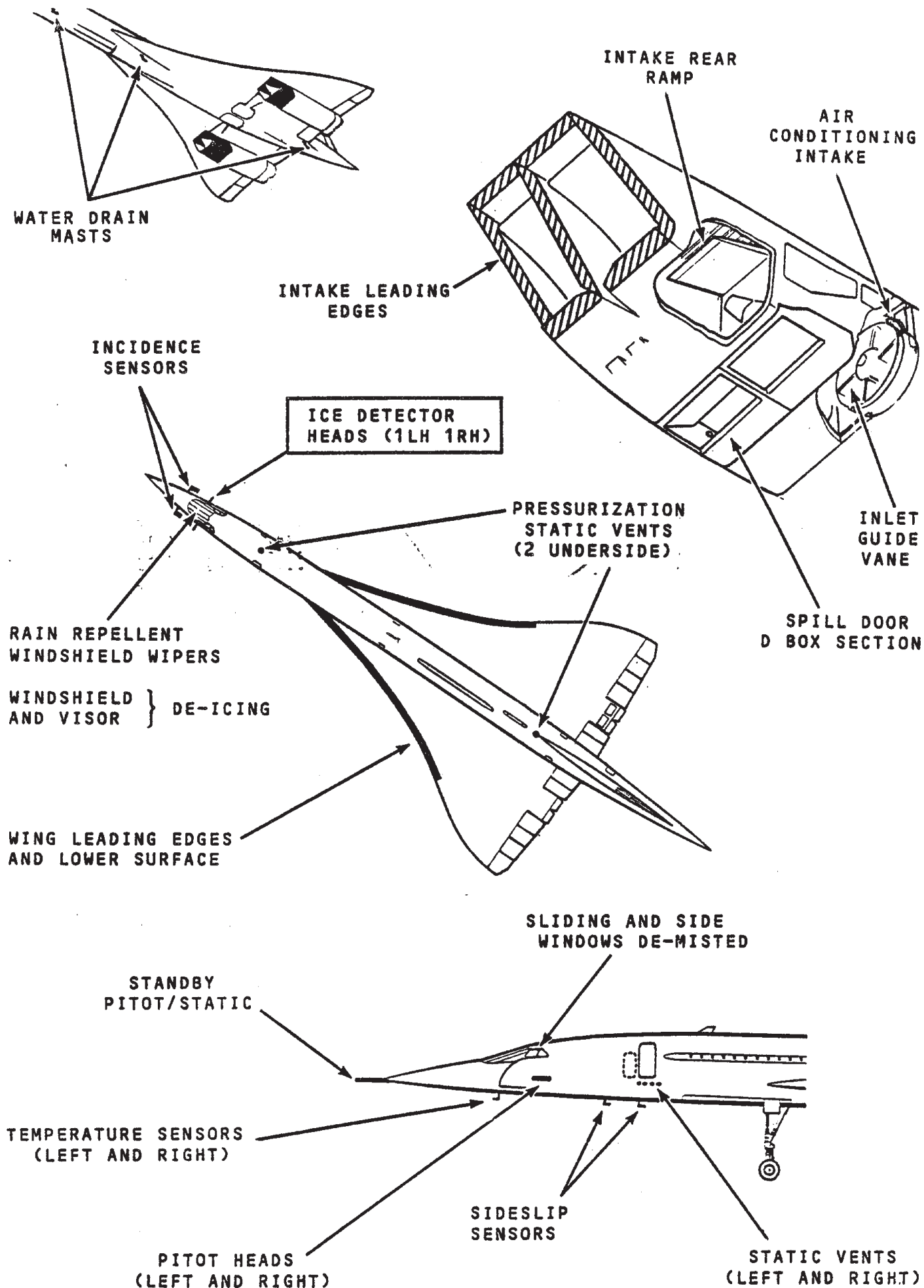
The pressurisation static vents are electrically heated.

DRAIN MAST HEATING

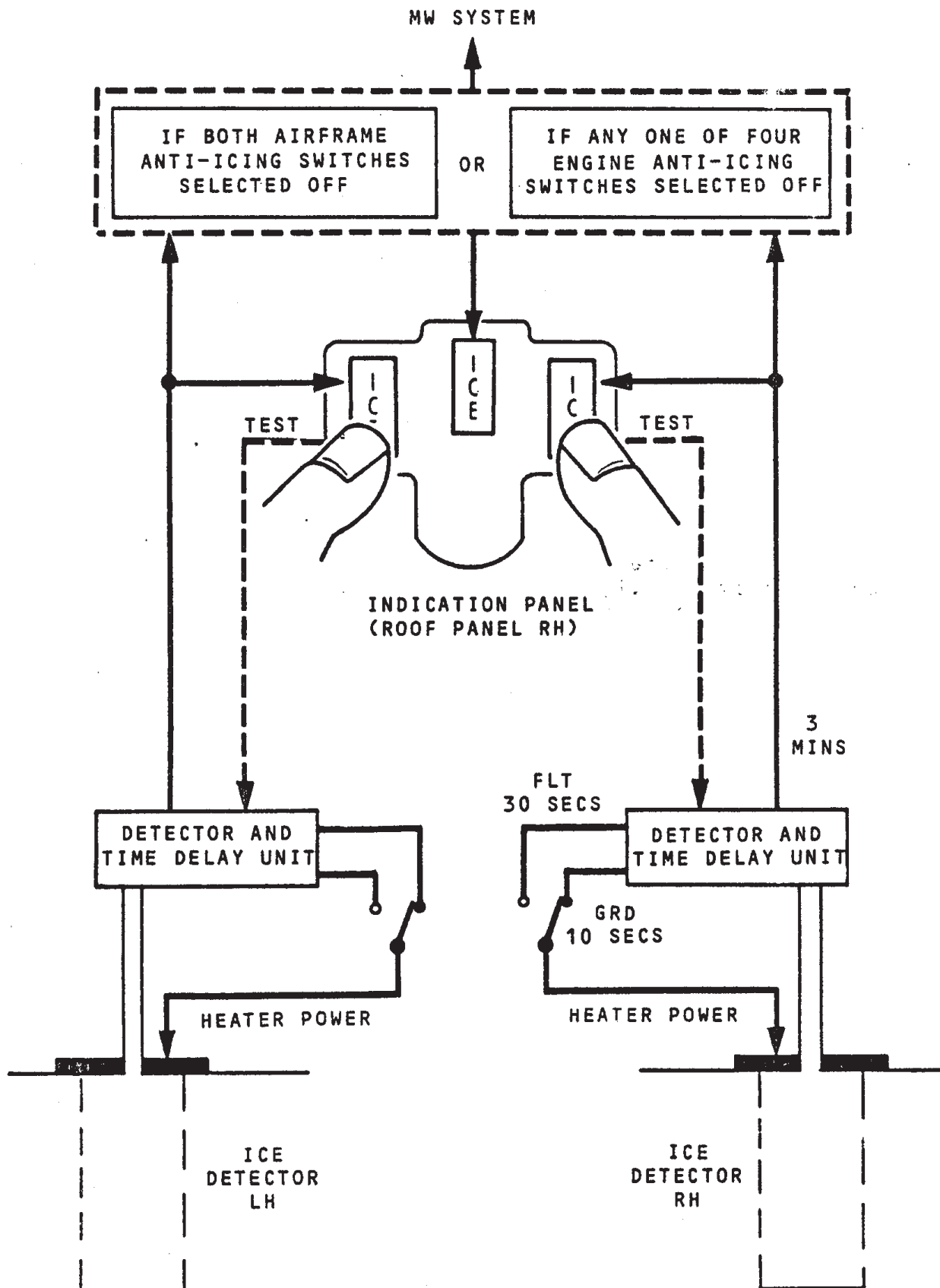
The drain masts are electrically heated.

DE-ICING

PRINTED IN ENGLAND

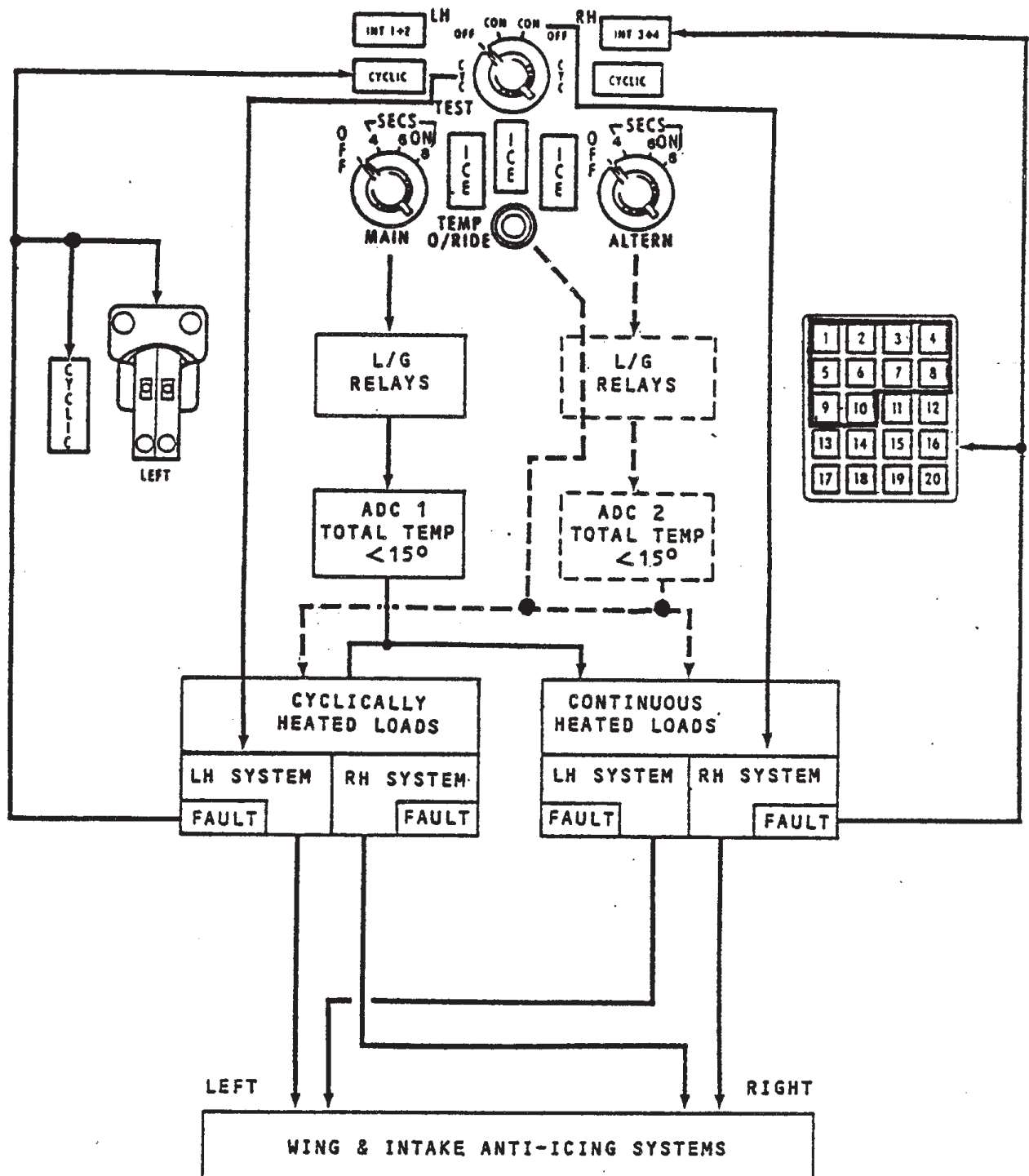


ICE DETECTION AND INDICATION



(Unchanged)

WING AND INTAKE ANTI-ICING CONTROL



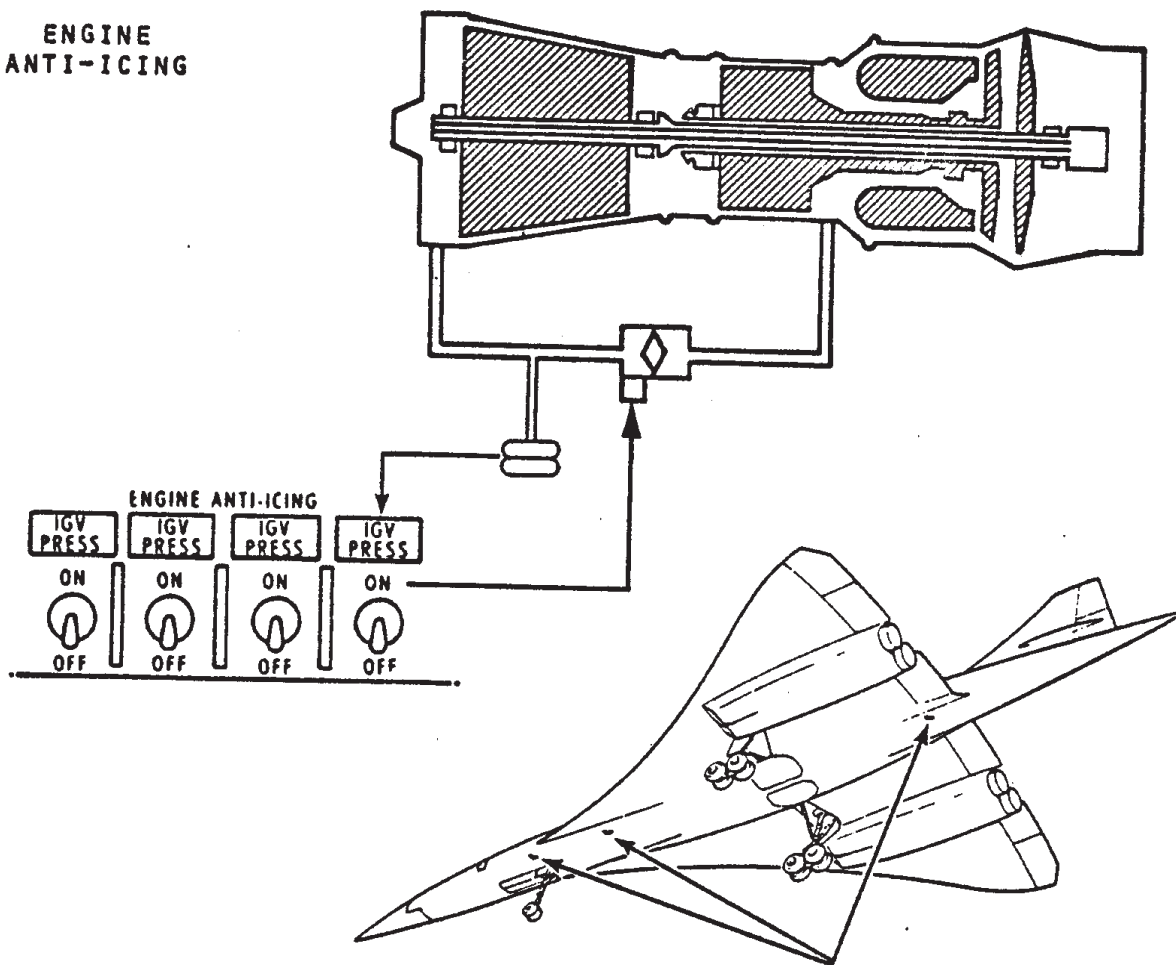
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CONCORDE FLYING MANUAL
ICE AND RAIN PROTECTION

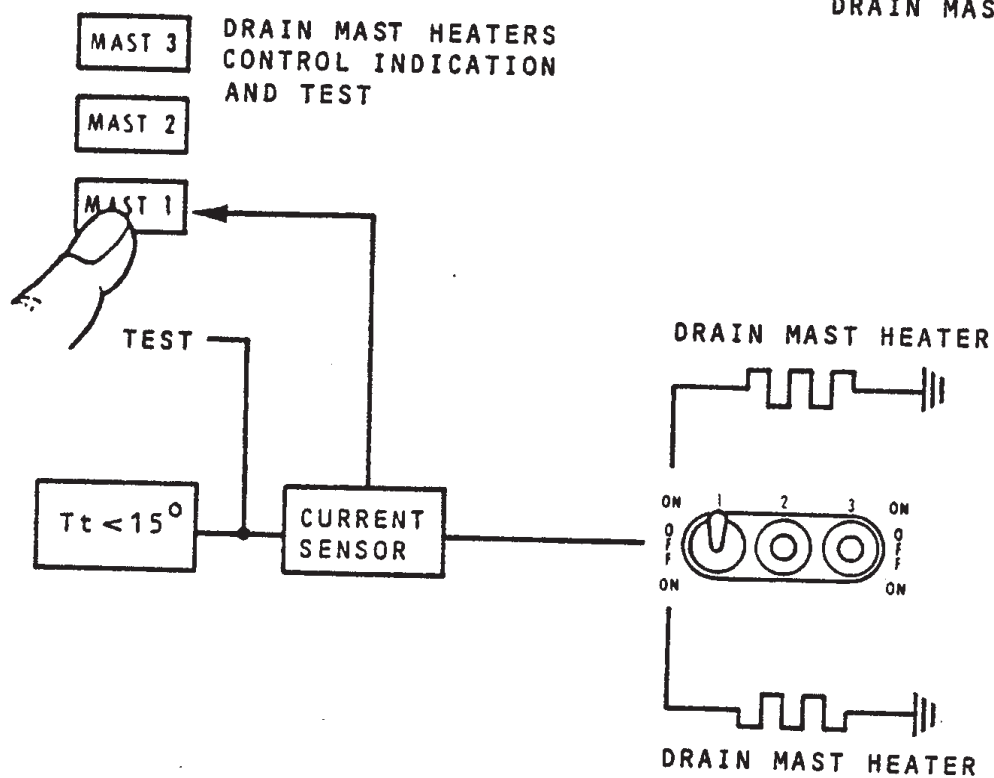
British airways
OVERSEAS DIVISION

ENGINE ANTI-ICING CONTROL

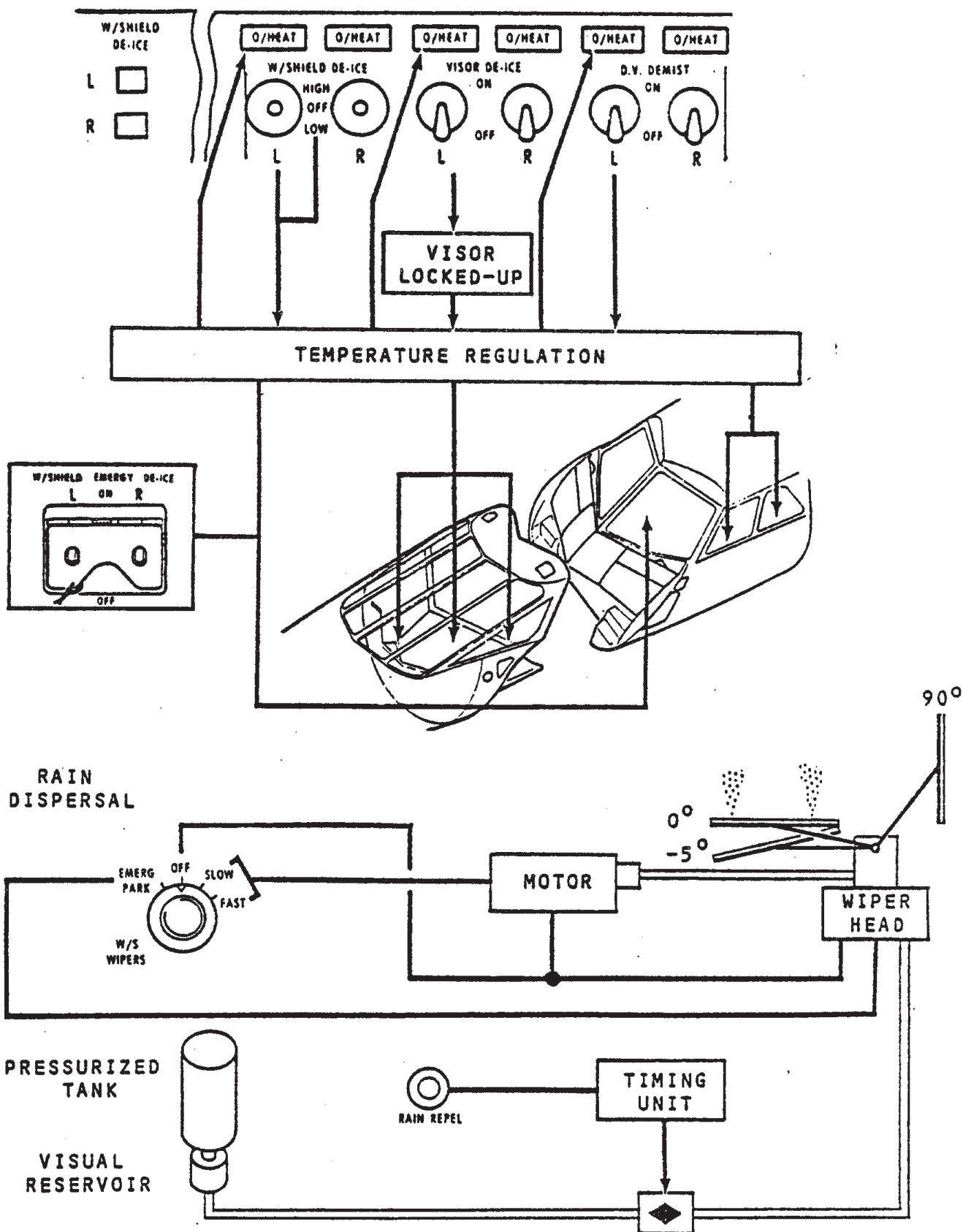
ENGINE
ANTI-ICING



HEATED
DRAIN MASTS



WINDSHIELD AND VISOR DE-ICING
AND RAIN DISPERSAL

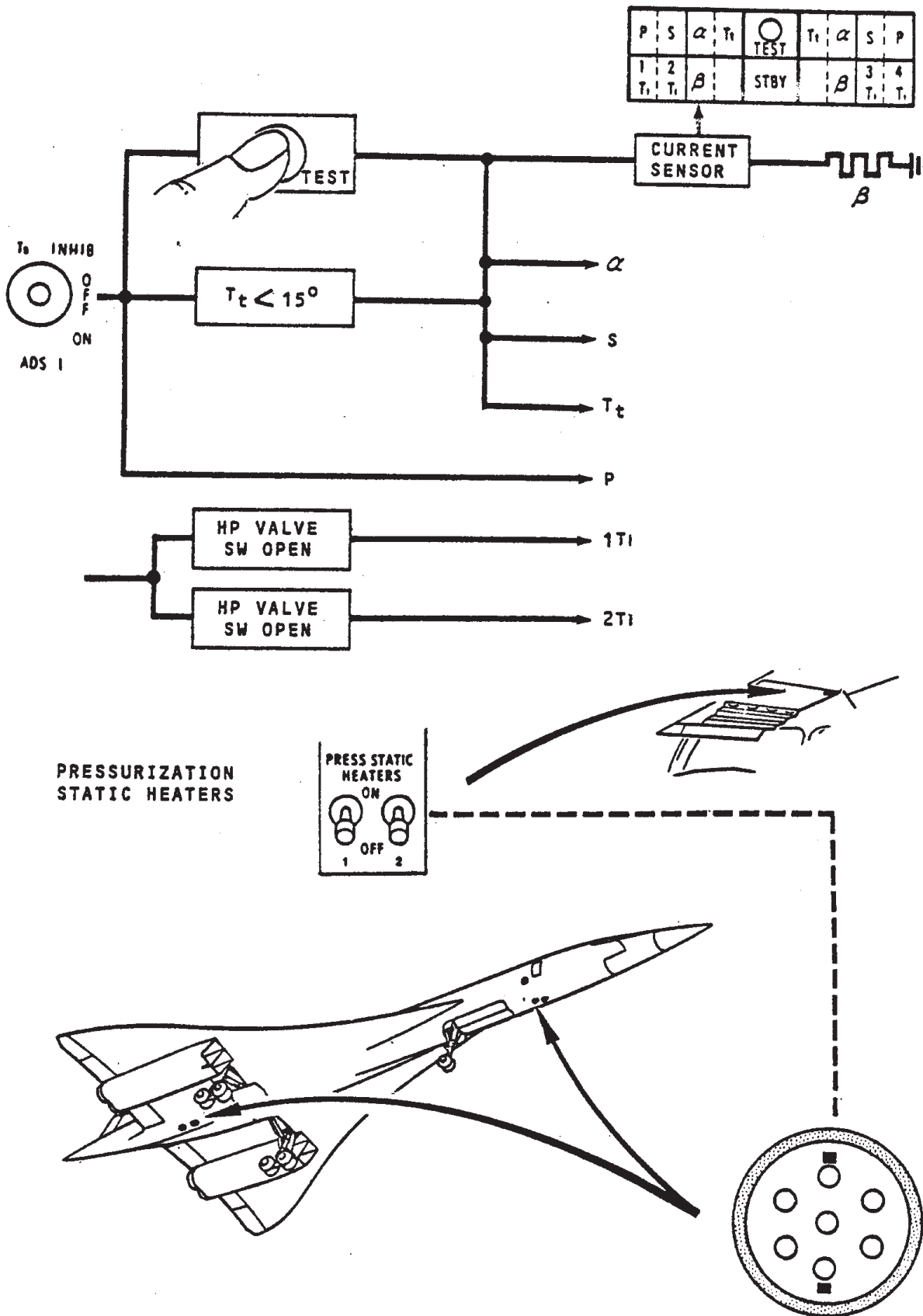


13.02.06
1 DEC.76

CONCORDE FLYING MANUAL ICE AND RAIN PROTECTION

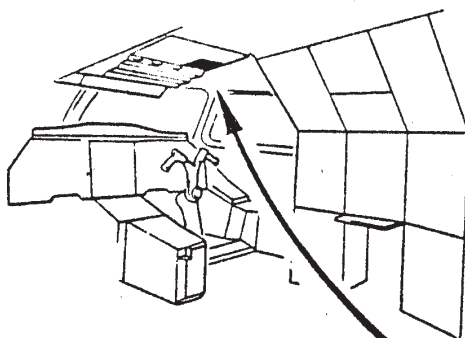
British airways
OVERSEAS DIVISION

ADS PROBE HEATING



PRINTED IN ENGLAND

(Unchanged)



ICE LIGHT (Red)

On - indicates that icing conditions have been detected and one or more ENGINE ANTI-ICING switches are at OFF or both the MAIN and ALTERN WING & INTAKE ANTI-ICING rotary selectors are at OFF.

Accompanied by the MWS ICE light (red) and audio (gong). The ICE light (red) goes off when the ENGINE ANTI-ICING switches (4) are set to ON and the WING & INTAKE ANTI-ICING—MAIN or ALTERN rotary selector is set to ON.

INTAKE LIGHT (Yellow) (2)

INT 1 + 2 or INT 3 + 4 light on indicates a fault in a continuously heated anti-icing area which may allow uncontrolled ice shedding into the indicated intakes.

INT 1 + 2 or INT 3 + 4 light on with the WING & INTAKE ANTI-ICING rotary selectors at OFF indicates that a heated area is powered although not selected.

NOTE: With the aircraft airborne and total temperature below plus 15 deg C, the INT lights (2) and CYCLIC lights (2) on together indicate a failure of the control lane.

CYCLIC LIGHT (Yellow) (2)

On - indicates a faulty heated area, it will be on every time the area is powered.

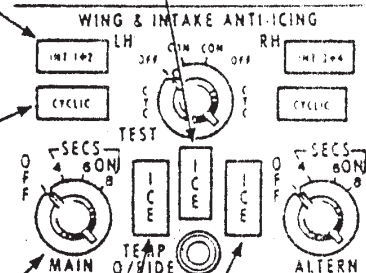
On - with the WING & INTAKE ANTI-ICING rotary selectors at OFF indicates that a heated area is powered although not selected.

After automatic cyclic shutdown set rotary selector momentarily OFF and press CYCLIC light to reset system.

MAIN ROTARY SELECTOR

- 4 SECS ON - the left and right wing and intake anti-icing systems are powered.
- OR
- 6 SECS ON - The cyclic areas are powered in turn with pulses of the selected duration.
- OR
- 8 SECS ON - The cyclic areas are powered in turn with pulses of the selected duration.

NOTE: The system is inhibited when the aircraft is on the ground or the temperature is above 15 deg C.

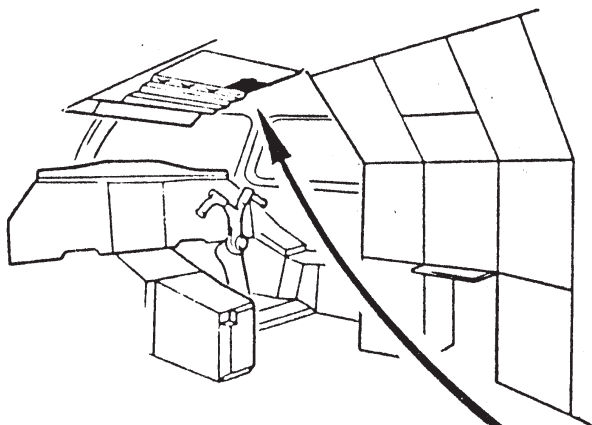


ICE LIGHT (Blue) (2)

On - indicates that icing conditions have been detected. The ICE lights (blue) will go off 3 mins after leaving icing conditions.

Pressing the ICE light (blue) tests the electrical part of the ice detector warning. With the aircraft on the ground it uses a reduced heater voltage and limits the heater operation to approximately 10 secs. The warning remains energized for 3 minutes.

ENGINE WING AND INTAKE ANTI-ICING
(Sheet 2 of 2)



WING & INTAKE ANTI-ICING
TEST ROTARY SELECTOR

CYC - sets in motion a test that powers each cyclically heated area for 0.5 second instead of the normal cyclic time. The test stops when the relevant CYCLIC light comes on, either when the test is completed and the digital indicator on the CYCLIC & CONTINUOUS DE-ICING panel shows 00, or, when a fault is detected and the digital indicator shows the number of the faulty area.

CON - tests the continuously heated areas and the functioning of the fault detection system, these areas are supplied with normal power for 3 seconds, then terminated, leaving the indication system energized for a further 3 seconds, thus giving full fault indication for that time.

TEMPERATURE O/RIDE PUSH
BUTTON

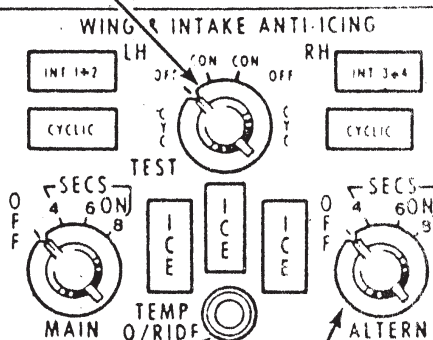
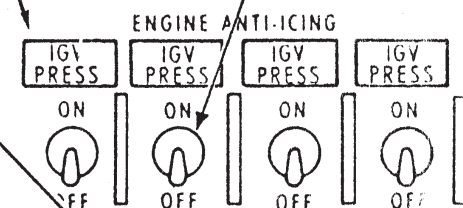
Pressed - with ALTERN selected ON will override the ADC temperature signal that normally inhibits the wing and intake anti-icing at temperatures greater than 15 deg C.

INLET GUIDE VANE PRESSURE
LIGHT (Green) (4)

On - to indicate that adequate hot air pressure is available for the engine anti-icing system.
Off - when the ENGINE ANTI-ICING switch is at ON indicates that hot air pressure is inadequate.

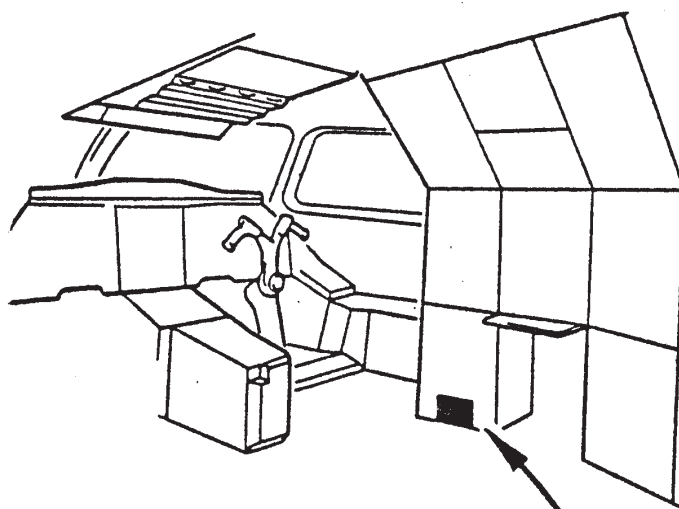
ENGINE ANTI-ICING
SWITCH (4)

ON - hot air is allowed to flow through the nose cone and the engine inlet guide vanes.



ALTERN ROTARY SELECTOR

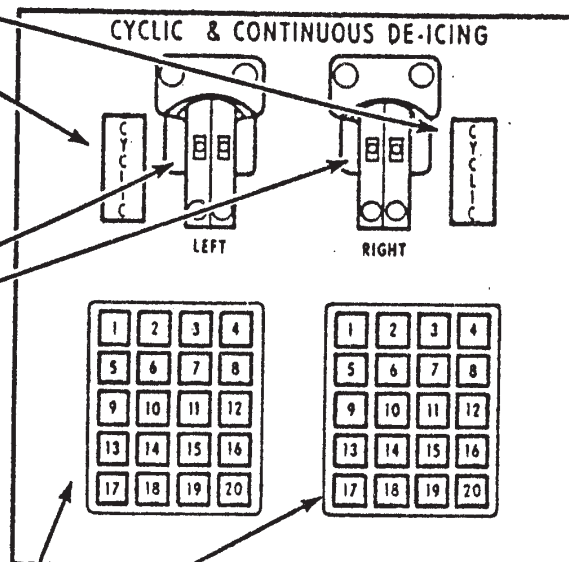
Selects an alternative control of the wing and intake anti-icing system.

**CYCLIC LIGHT (Yellow)**

The left or right light is on coincident with the left or right cyclic light on the rear overhead panel.

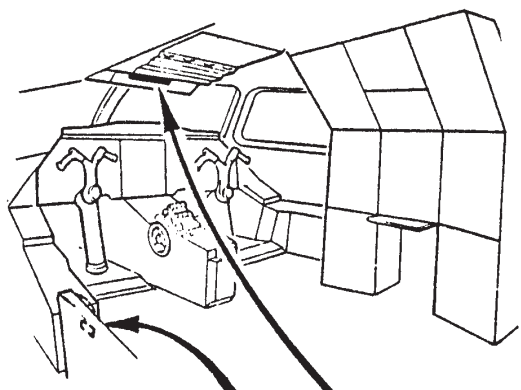
DIGITAL COUNTER

Shows the number of the cyclic area being powered.

**NUMBERED CAPTION LIGHTS (Yellow)**

A block of 20 lights is available for each side of the continuous de-icing system. Only 10 on each side are used. They indicate which continuously heated area is faulty.

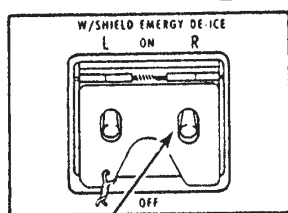
VISOR, WINDSHIELD AND D.V. WINDOW HEATING



DE-ICE OR DEMIST O/HEAT LIGHT (Yellow) (6)

On - indicates that panel heating has reached overheat control temperature and power is off.

Regulation in the overheat control temperature range is indicated by the O/HEAT light going on and off.



WINDSHIELD DE-ICE O/HEAT LIGHT (Yellow) (2)

On - steady - with W/SHIELD EMERGENCY DE-ICE selected emergency heating is in operation.

W/SHIELD EMERGENCY DE-ICE SWITCH (2)

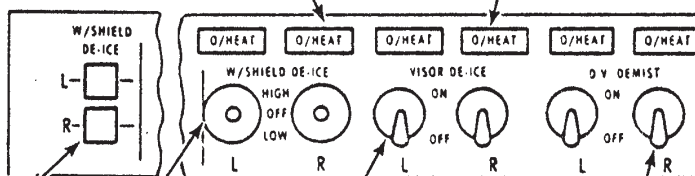
ON - by-passes the windshield heat control system to power directly the central part of the windshield at the high voltage setting. Lights the O/HEAT light but does not operate the SHIELD DE-ICE MI.

W/SHIELD DE-ICE MI (2)

-  - INLINE indicates power is supplied to windshield
-  - DE-ENERGISED
-  - CROSSLINE indicates panel heating has reached control temperature and power is OFF.

WINDSHIELD DE-ICE SELECTOR (2)

- HIGH** - windshield panels are heated by high voltage and automatically maintained at working temperature. With a W/SHIELD DE-ICE selector at HIGH the associated windshield de-icing system will automatically change to LOW condition if the visor is raised or the aircraft is on the ground.
- LOW** - windshield panels are heated by low voltage and automatically maintained at working temperature.



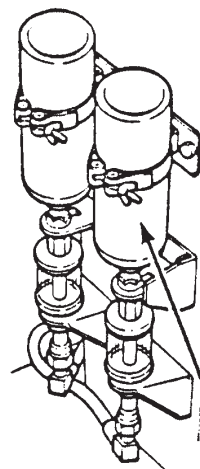
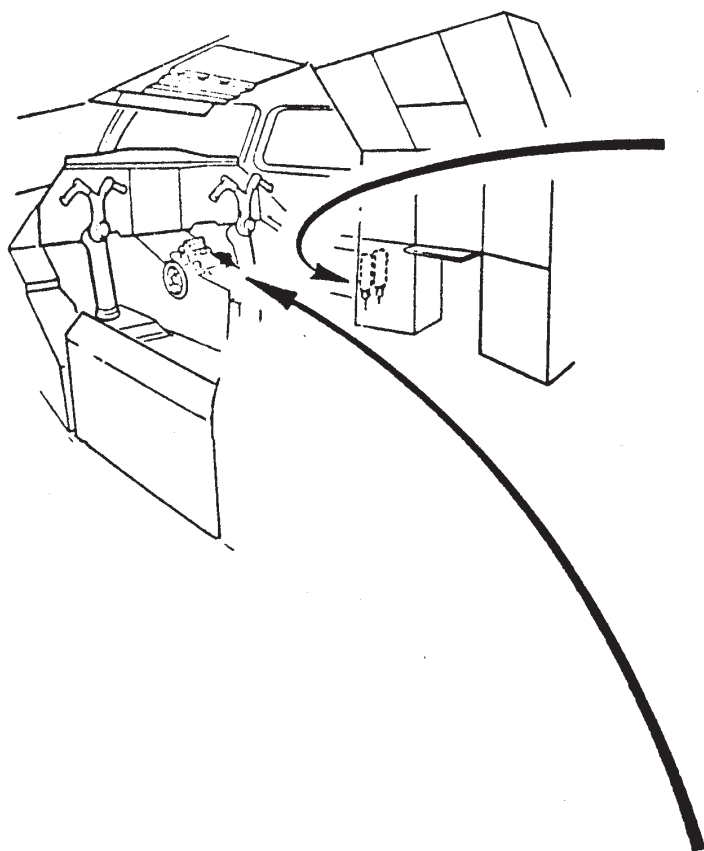
VISOR DE-ICE SWITCH (2)

ON - with the visor locked UP the visor panels are heated and automatically maintained at working temperature. The visor heater operates only when the visor is locked up.

SLIDING SIDE WINDOW DEMIST SWITCH (2)

ON - sliding side panels are heated and automatically maintained at working temperature.

RAIN DISPERSAL



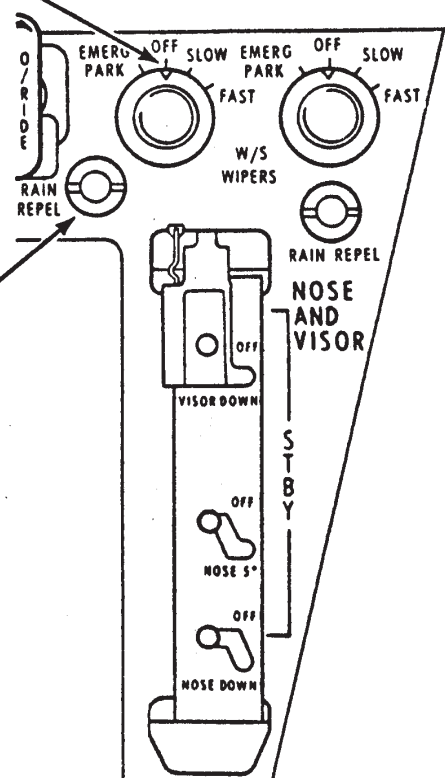
RAIN REPELLENT BOTTLE (2)

Low quantity is indicated when float is below top of sight glass.

WINDSHIELD WIPERS ROTARY SELECTOR (2)

OFF - selects the park position.
With a wiper not fully parked, the normal operation of the visor raise sequence is inhibited.
EMERG PARK - provides a second system to park the wiper.

SLOW } - selects wipers on.
FAST }

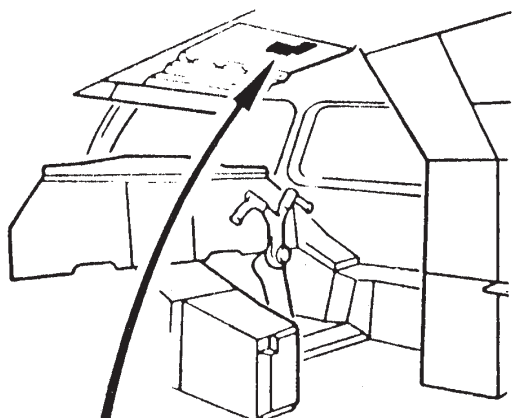


RAIN REPEL PUSH BUTTON (2)

CAUTION
THE RAIN REPEL PUSH BUTTONS
ARE UNGUARDED

Pressing the RAIN REPEL push button applies a predetermined quantity of rain repellent liquid to the windshield.

DRAIN MAST HEATERS

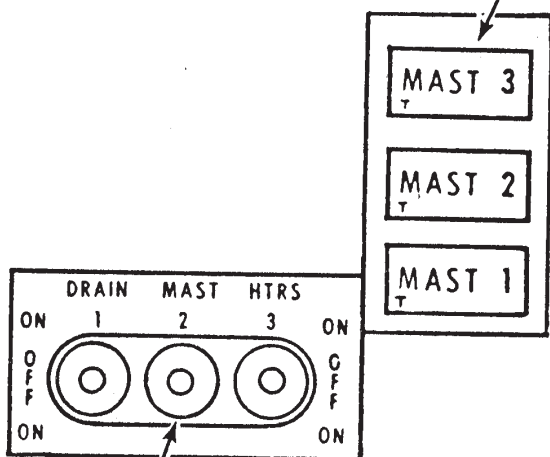


MAST LIGHT (Yellow) (3)

Pressing a MAST light while the selector is at OFF tests the failure warning system. The light on indicates correct operation.

Pressing a MAST light while the selector is at ON tests the failure warning system. The light on (yellow) indicates an inoperative heater.

A MAST light (yellow) on with the DRAIN MAST HTRS selector at ON indicates incorrect mast heater operation.



DRAIN MAST HEATERS SELECTOR (3)

ON - powers a drain mast heater provided that the ADC switches are at ON and that the total temperature is below plus 15 deg C. There are two ON positions for each selector; each position supplies a separate but similar heater. Either ON position may be used as the normal selection.

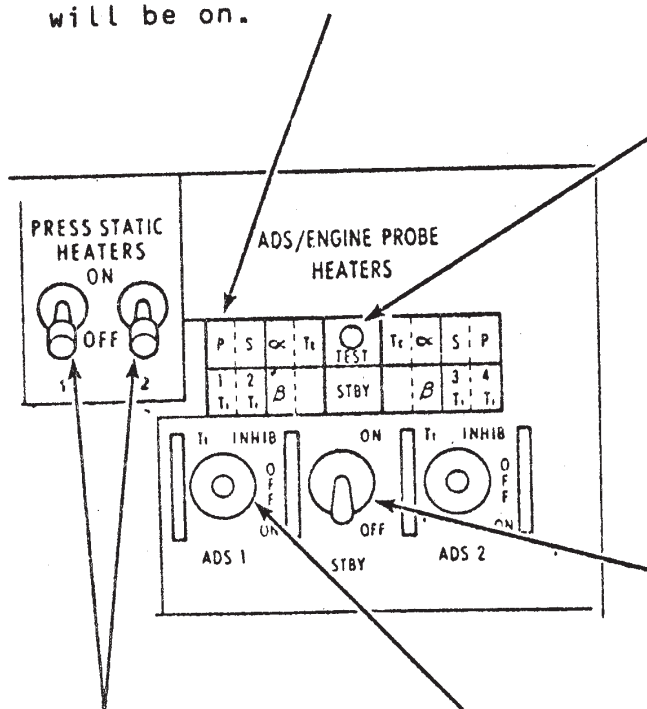
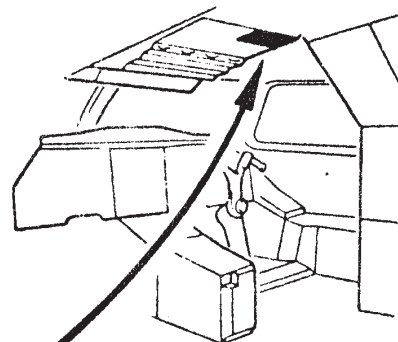
(Unchanged)

ADS AND ENGINE PROBE HEATERS

AIR DATA SYSTEM/ENGINE PROBE HEATERS LIGHT (yellow)(15)

On - with selectors at ON.
indicates that the associated heater is powered but inoperative.
On - with the ADS probe heaters selectors (2) and the STBY switch at OFF, indicates that the heater failure indication system is serviceable.

NOTE - If the ADS/probe heater selector is at T_t INHIB and the temperature is below plus 15 deg C the associated T_t light (yellow) will be on.



TEST PUSH BUTTON

Pressed - with the ADC switches (2) at ON, the ADS/probe heaters selectors (2) at ON and total temperature above + 15 deg C, overrides the above 15 deg C inhibition of the S, α , T_t and β sensor heating.

STANDBY SWITCH

ON - powers the heater in the standby pitot static probe.

PRESSURIZATION STATIC HEATER SWITCHES

AIR DATA SYSTEM PROBE HEATERS SELECTOR (2)

T_t INHIB - the pitot probe heaters P are powered. The static sensor heaters S, angle of attack sensor heaters α and sideslip sensor heaters β are powered when the total air temperature is below plus 15 deg C. The total air temperature sensor heaters T_t are inhibited.

ON - the pitot probe heaters P are powered. The total air temperature sensor heaters T_t , the static sensor heaters S, angle of attack sensor heaters α and sideslip sensor heaters β are powered when the total air temperature is below plus 15 deg C.

Chapter 14

LANDING GEAR

LANDING GEAR

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LANDING GEAR

GENERAL

The aircraft has a tricycle landing gear plus a tail gear; it comprises four wheel bogies on each main gear, twin wheels on the nose gear and a twin wheel tail gear. The landing gears and doors are hydraulically powered.

A standby system, powered and actuated independently of the main system, plus a free fall capability provide two back-up systems. Dual, hydraulic-powered multi-disc wheel brakes, with anti-skid control systems, are provided on the main gear. An accumulator provides emergency braking pressure in the event of the loss of the hydraulic systems.

NORMAL OPERATION

Normal operation of the landing gear is achieved through electrical control by the landing gearlever and hydraulic power supplied by the green system. Once retracted, in addition to mechanical locks, hydraulic pressure holds the gear and doors. However, when the L/GEAR lever is at NEUTRAL, both electrical control and hydraulic supply are shut off leaving the doors held by the mechanical locks, thus preventing inadvertent landing gear extension through control or actuator failure. During the landing gear retraction the main and nose wheels are automatically braked and released.

STANDBY OPERATION

Standby operation of the landing gear is achieved through a separate control lever and is independently powered by the yellow hydraulic system.

FREE FALL OPERATION

Free fall of the nose landing gear is achieved through a mechanical device, situated under the forward cabin floor, that releases the nose landing gear and doors uplocks thus allowing the gear and doors to free fall.

Free fall of the main landing gear is achieved through a mechanical device, situated under the rear cabin floor, that releases the main landing gears and doors uplocks thus allowing the gear and doors to free fall. If the main landing gear does not lock down, pressurized air from the hydraulic reservoir pressurization line can be directed to the telescopic side strut. This air pressure will extend the strut, provided the landing gear is nearly down, thereby engaging the down lock.

To assist in locating the free fall controls, a starboard hat rack in both the forward and the rear cabin is identified with 1 red and 1 green disc at a position adjacent to each control panel.

BRAKES AND ANTI SKID

Normal brakes and anti-skid systems are supplied by the green hydraulic system. In the event of a green system pressure loss there is an automatic changeover to the yellow hydraulic system provided YELLOW-GREEN has been selected on the SERVO CONTROLS yellow rotary selector.

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A brakes accumulator charged by the yellow hydraulic system supplies the emergency and parking brakes system only.

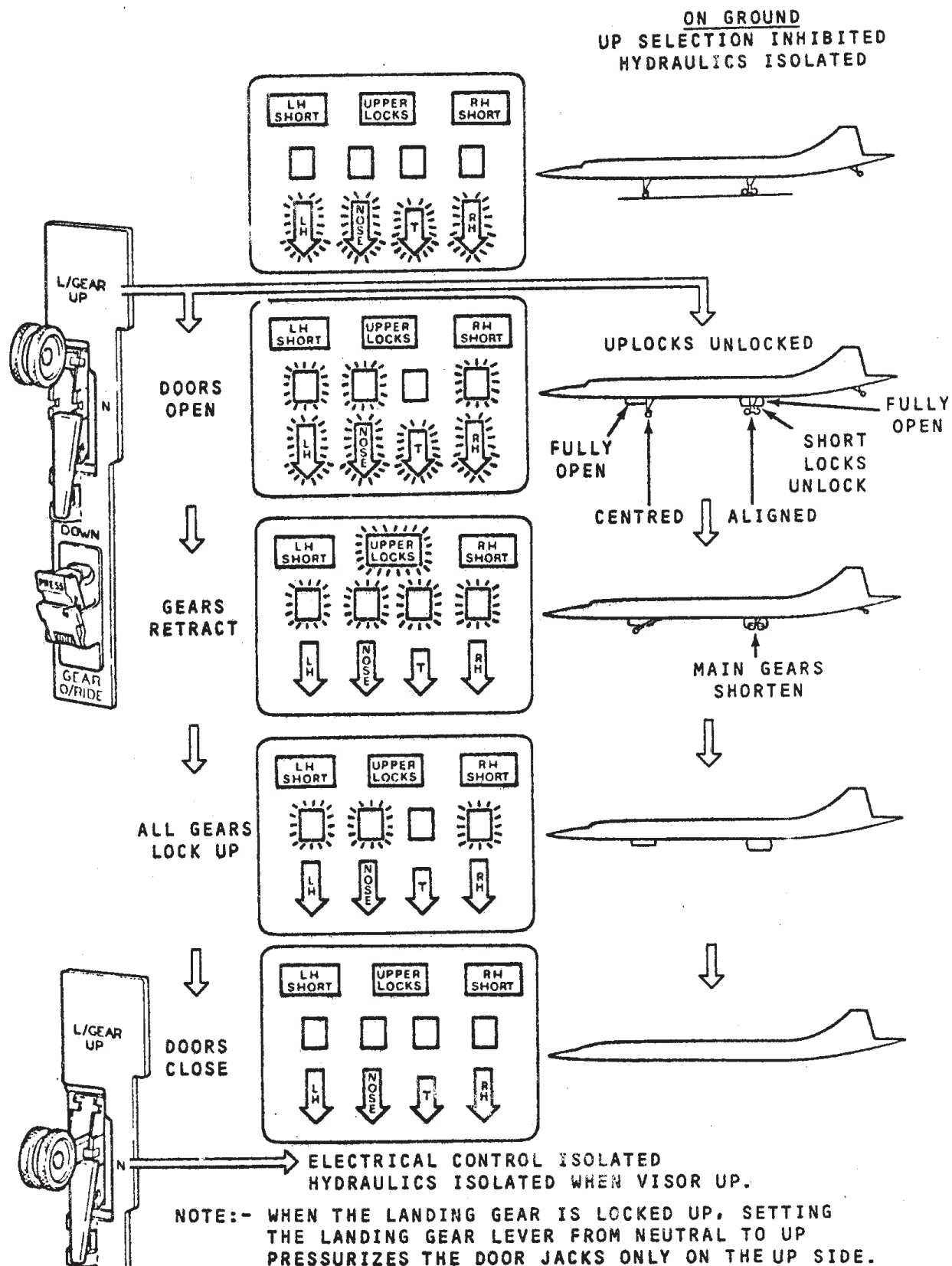
NOSEWHEEL STEERING

The nosewheel steering is electrically controlled, through the rudder pedals and hand wheels, and hydraulically operated. The normal operation uses the green hydraulic system with standby power from the yellow hydraulic system.

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NORMAL 'UP' SELECTION

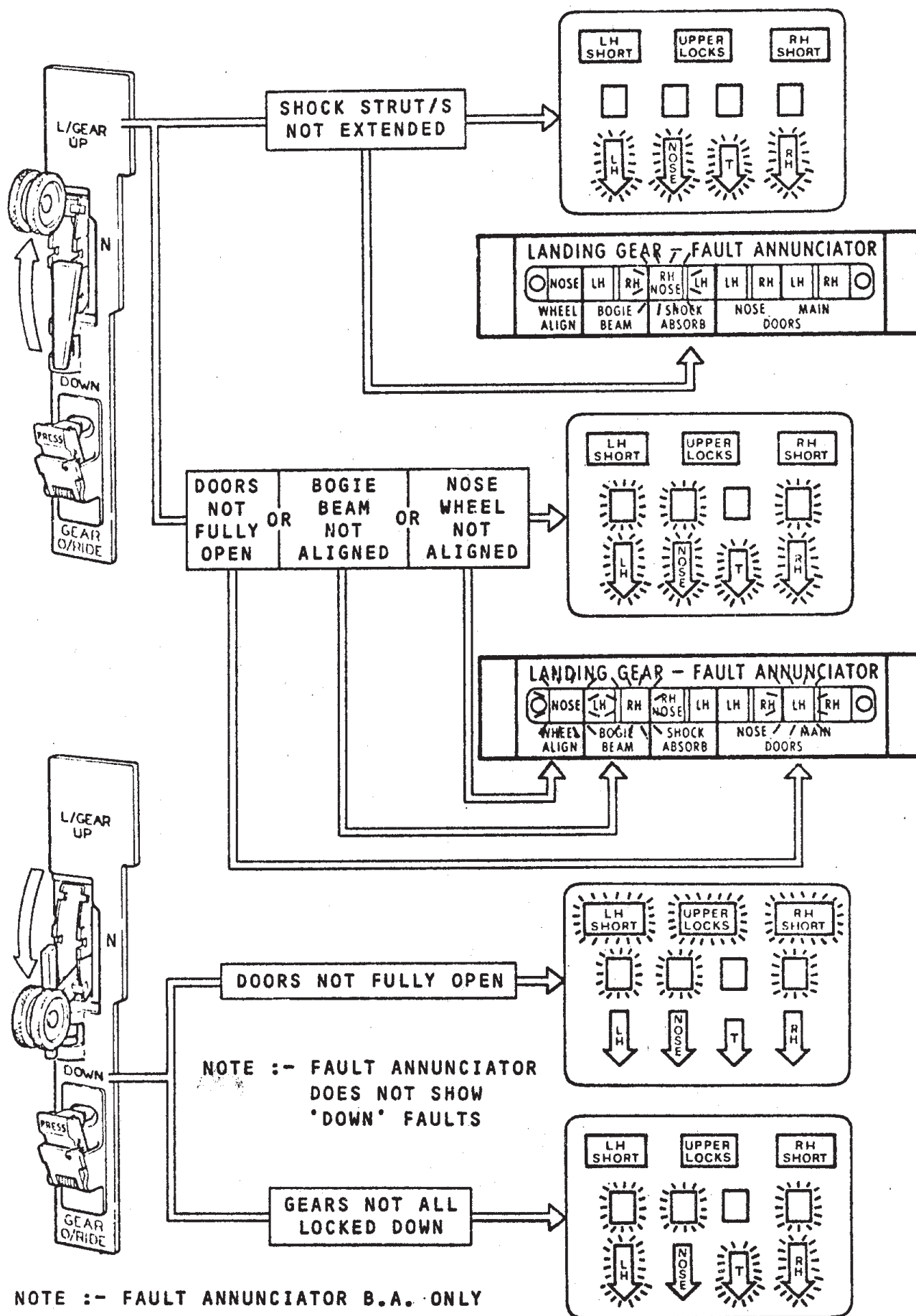


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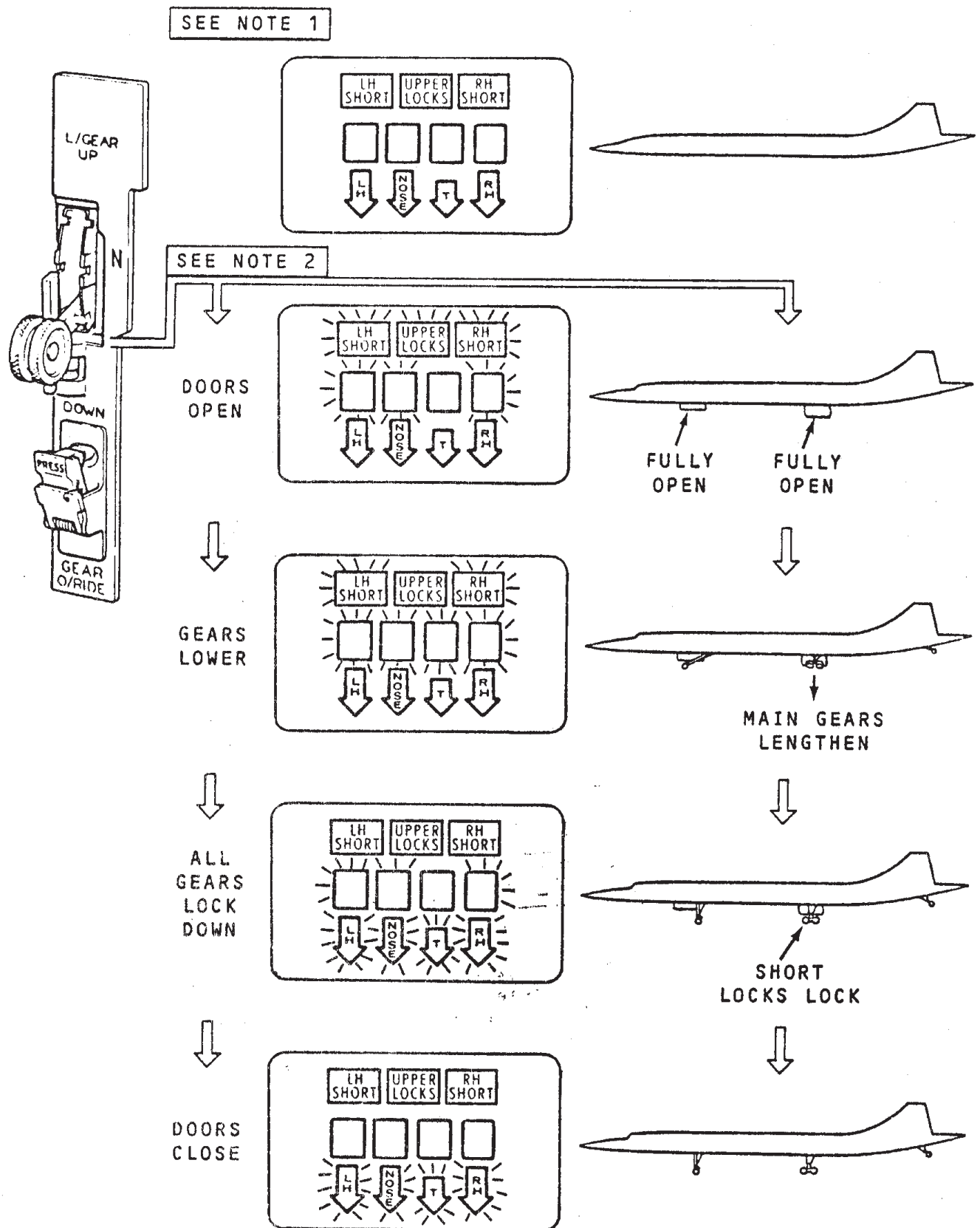
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BASIC SEQUENCING FAULTS



NORMAL 'DOWN' SELECTION



NOTE 1: LANDING GEAR NORMAL HYDRAULICS ISOLATED WHEN VISOR UP.

NOTE 2: VISOR MUST BE DOWN AND R.A.T SELECTORS AT OFF TO INITIATE LOWERING SEQUENCE.

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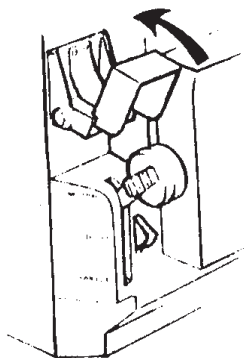
CONCORDE FLYING MANUAL

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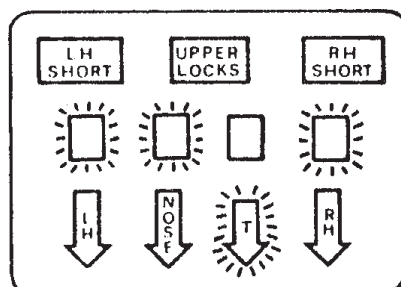
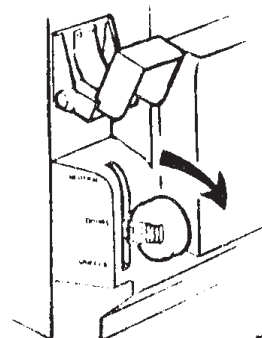
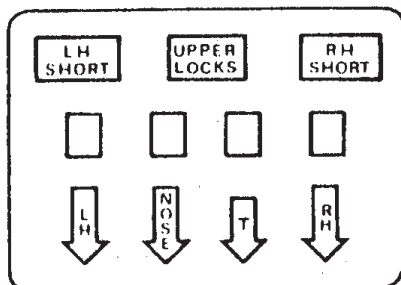
STANDBY 'DOWN' SELECTION

SET NORMAL SELECTOR TO 'NEUTRAL'

CHECK YELLOW SYSTEM HYDRAULIC PRESSURE AVAILABLE



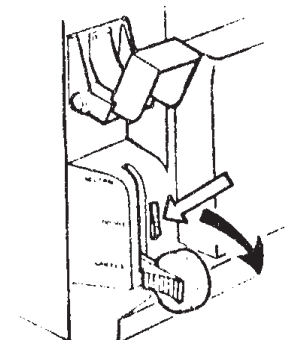
RAISE GUARD



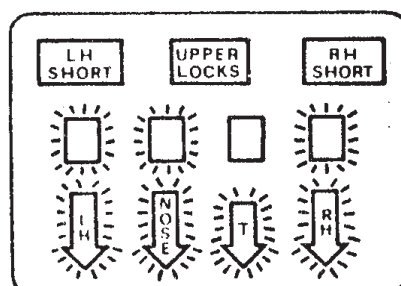
DOORS OPEN - TAIL GEAR EXTENDED

PRESS KNOB CATCH
SELECT DOORS
WAIT 4 SECS
THEN.....

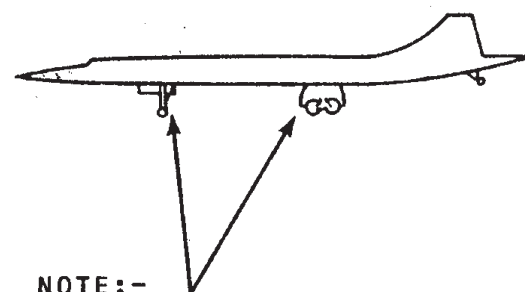
GREEN PRESSURE ISOLATED



PRESS GATE CATCH
SELECT WHEELS



GEARS EXTEND

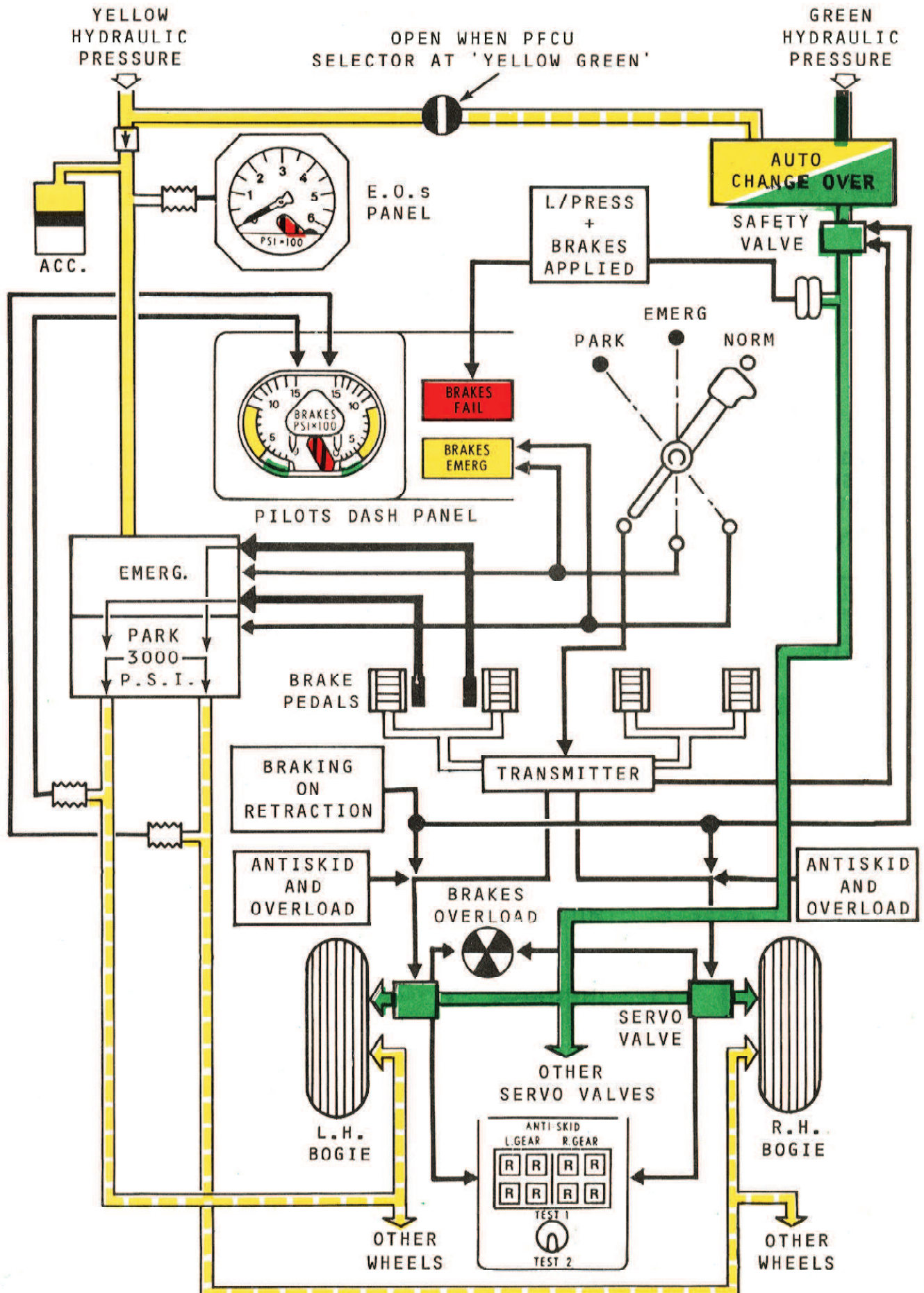


NOTE:-
DOORS REMAIN OPEN

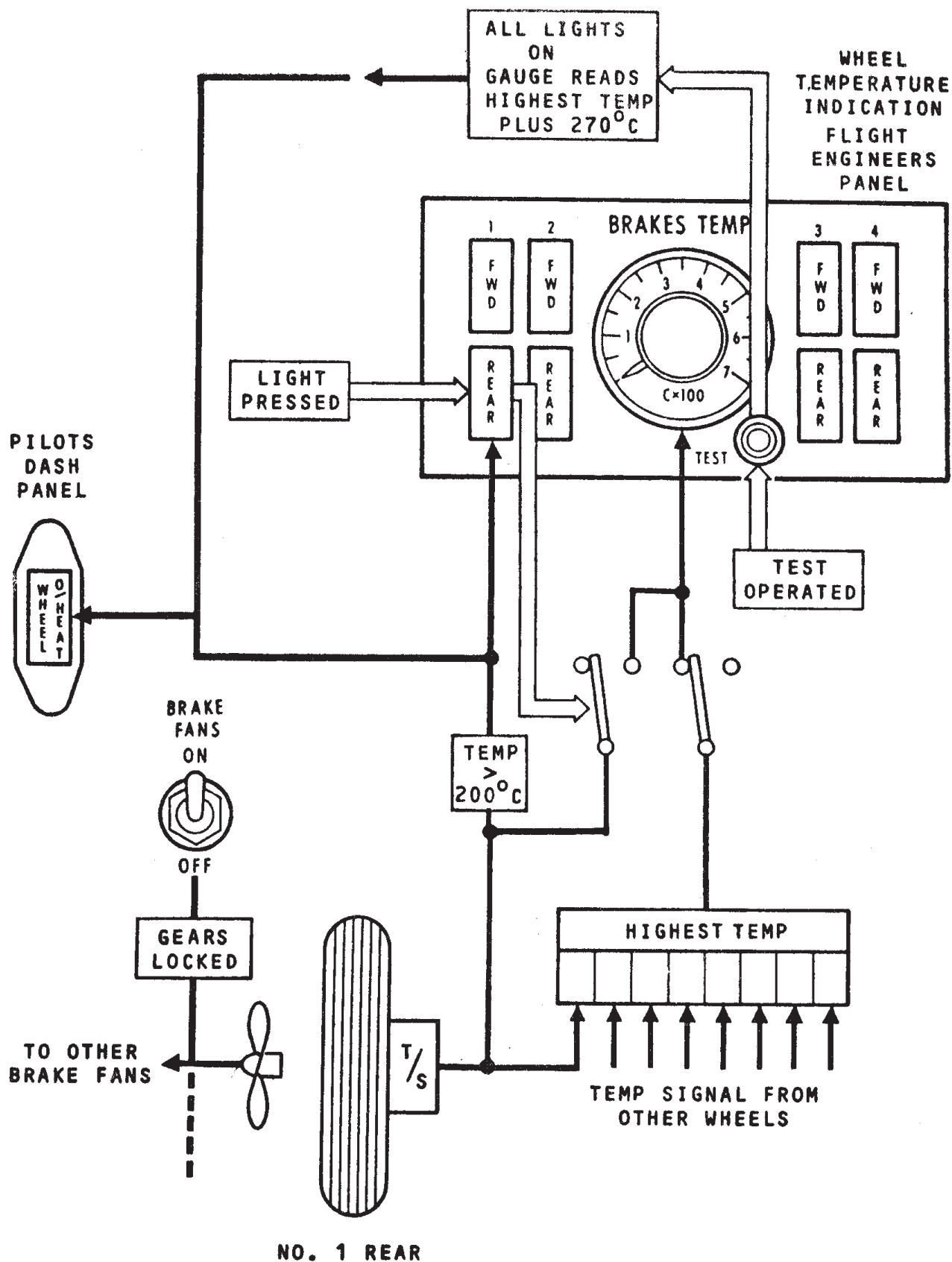
NOTE:- IN ORDER TO CHECK 'SHORT LOCKS' LIGHTS, NORMAL SELECTOR MUST BE SET TO 'DOWN'

(Unchanged)

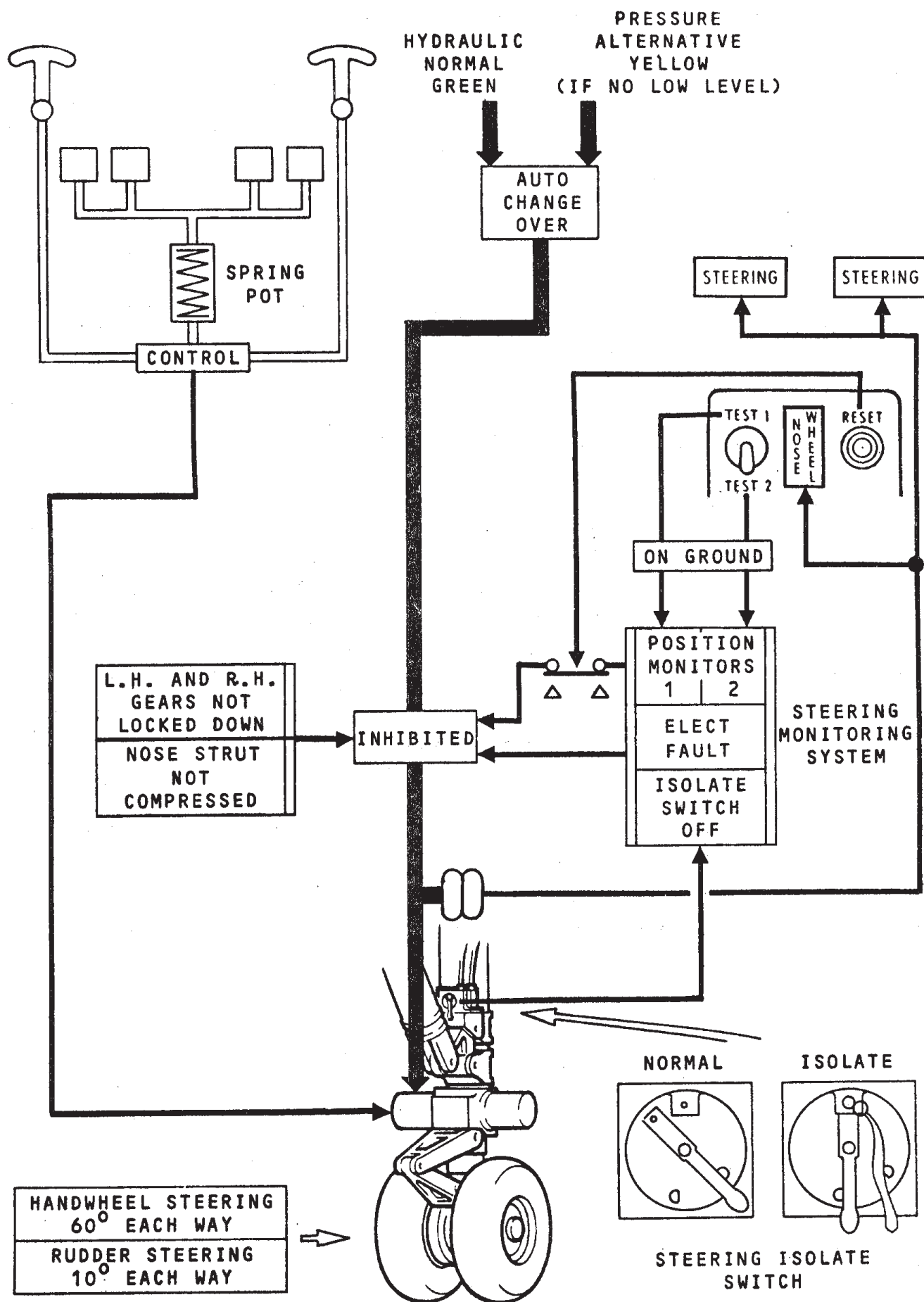
BRAKES SYSTEM



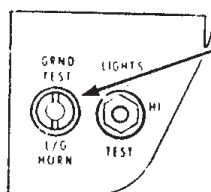
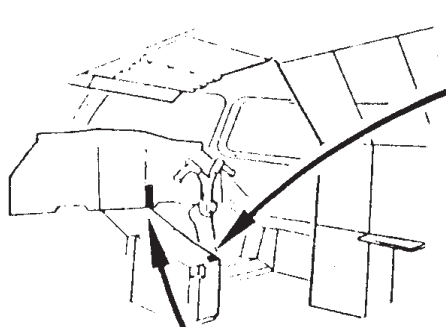
BRAKES TEMPERATURE



STEERING



NORMAL CONTROL



L/G HORN GRND TEST
PUSH BUTTON

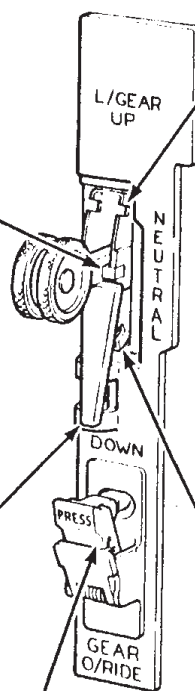
Pressed - with an ADC on and throttles away from maximum power position, tests the Landing Gear Horn.

UP POSITION

To move the L/GEAR lever from down to UP, pull the lever knob and set to UP. The action of pulling the L/GEAR lever removes a safety baulk between NEUTRAL and UP providing the LH main shock absorber is extended.

NEUTRAL POSITION

To move the L/GEAR lever from UP to NEUTRAL, pull the lever knob and set to NEUTRAL. AT NEUTRAL the landing gear electrical control is de-activated, the gear and door selector valves go to their neutral position and the landing gears and doors are held by mechanical locks. In addition, provided the visor is locked in the up position the green hydraulic supply to the landing gear and door selectors is shut off thus preventing any inadvertent landing gear extension in supersonic flight.



SPRING LOADED GUARD

The guard secures the L/GEAR lever in the NEUTRAL position to prevent inadvertent landing gear DOWN selection.

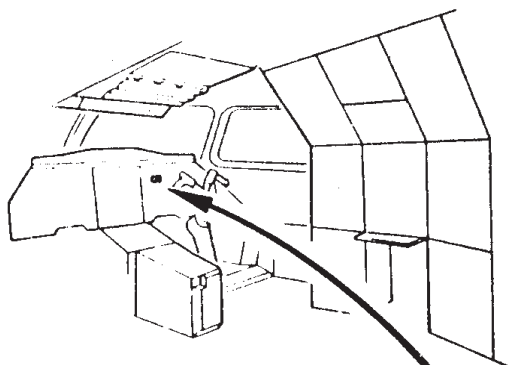
DOWN POSITION

To move the L/GEAR lever from NEUTRAL to DOWN pull the lever knob, move the spring loaded guard to the left, and set to DOWN. NOTE: At DOWN the yellow hydraulic system engine driven pumps are unloaded.

GEAR O/RIDE PUSH BUTTON

Pressed-overrides the safety baulk between NEUTRAL and UP position. When GEAR O/RIDE has been used a spring loaded flap drops to expose a RED and YELLOW striped flag.

NORMAL ANNUNCIATOR PANEL



LANDING GEAR UPPER LOCKS
LIGHT (Amber)

On - with the L/GEAR lever
at DOWN indicates that a gear
uplock is in an engaged
condition.
On - with the L/GEAR lever
at NEUTRAL or UP indicates
that a gear uplock is not
engaged.

LEFT LEG SHORT LIGHT
(Amber)

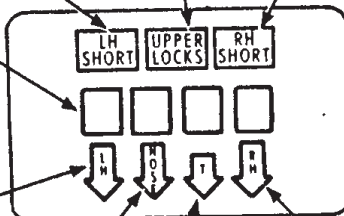
Armed only when the
L/GEAR lever at down.
On - indicates that the
shortening lock is not
engaged.

RIGHT LEG SHORT LIGHT
(Amber)

Armed only when the
L/GEAR lever at DOWN.
On - indicates that the
shortening lock is not
engaged.

LANDING GEAR TRANSIT
LIGHT (Red) (4)

On - indicates that the corres-
ponding main or nose landing
gear doors are not closed or
in the case of the tail gear
it is in transit.



LEFT LEG ARROW LIGHT
(Green)

On - indicates that the
left hand leg of the
gear is down and locked.

RIGHT LEG ARROW LIGHT
(Green)

On - indicates that the
right hand leg of the
gear is down and locked.

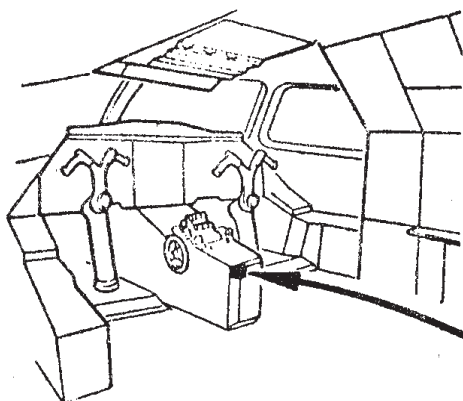
NOSE GEAR ARROW LIGHT
(Green)

On - indicates that the
nose gear is down and
locked.

TAIL GEAR ARROW LIGHT
(Green)

On - indicates that the
tail gear is down and
locked.

STANDBY LOWERING LEVER



STANDBY LOWERING LEVER

NEUTRAL - the landing gear standby selector valve goes to the neutral position, thus removing yellow hydraulic pressure from the landing gear door and lock jacks.

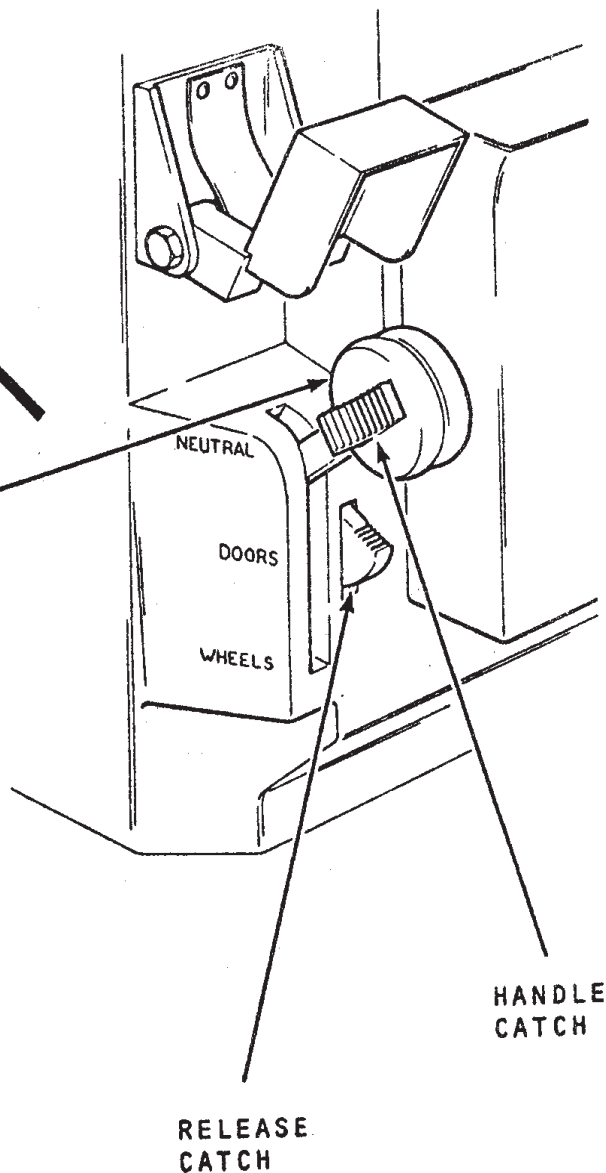
To set the lever to **DOORS**, the handle catch must be pressed.

DOORS - the hydraulic fluid return is connected to the yellow hydraulic reservoir and the green hydraulic supply to the gear and doors selector is shut off. The yellow hydraulic system then releases the nose and main landing gear door uplocks and lowers the doors and the tail-wheels. The doors are fully open at approximately 2 seconds.

To set the lever to **WHEELS**, both the handle catch and the separate release catch must be pressed.

WHEELS - the yellow hydraulic system releases the nose and main gear uplocks and lowers the nose and main gear.

NOTE: The doors will remain fully open.



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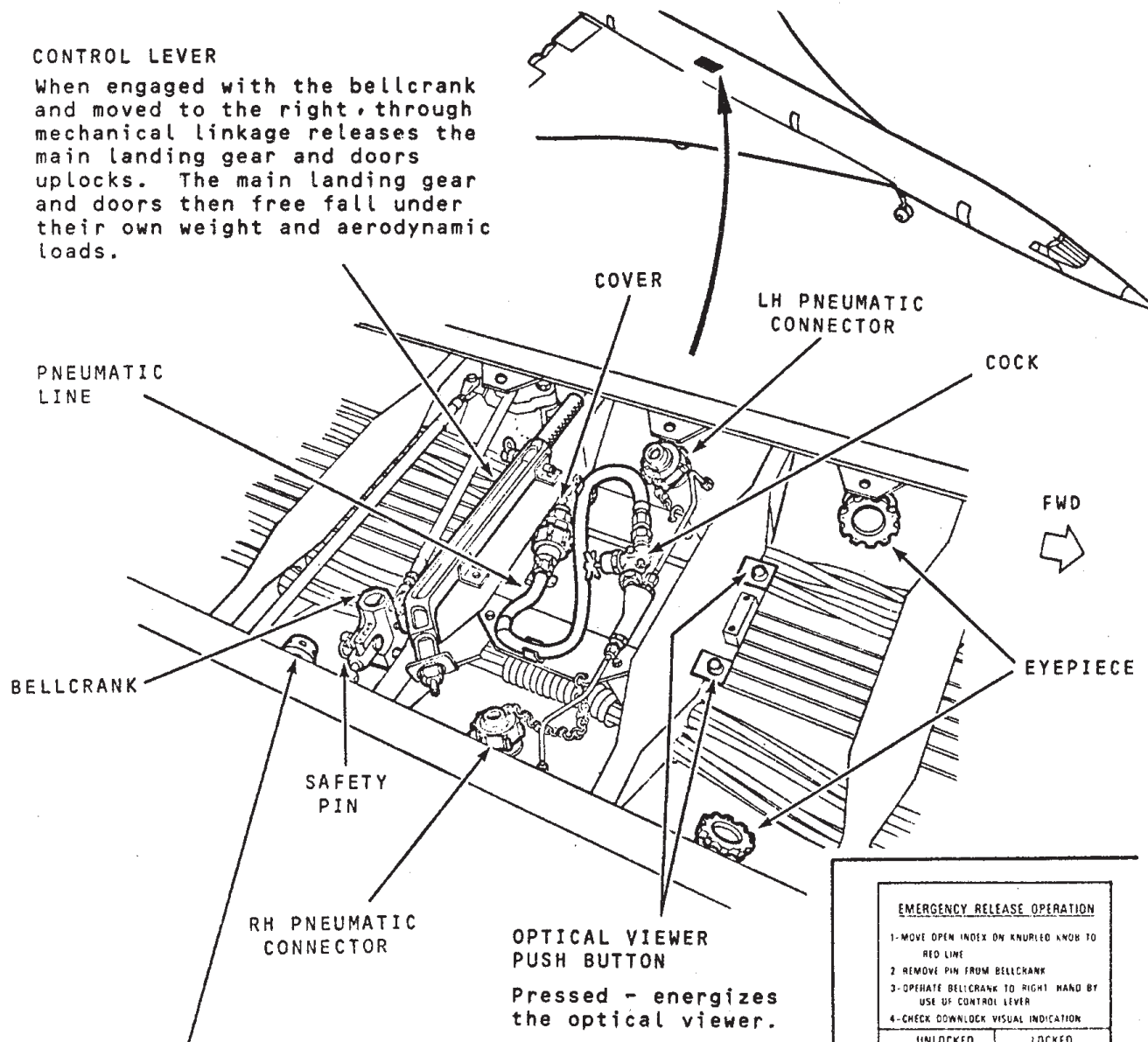
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MAIN GEAR FREE FALL

CONTROL LEVER

When engaged with the bellcrank and moved to the right, through mechanical linkage releases the main landing gear and doors uplocks. The main landing gear and doors then free fall under their own weight and aerodynamic loads.



KNURLED KNOB

Through mechanical linkage, opens an auto-depressurization valve in the main landing gear hydraulic system, thus confirming cut-off of the green hydraulic pressure to the main landing gears. It also vents the return side of the main landing gear and door jack to atmosphere.

NOTE: The control lever may be used to assist in unscrewing the knurled knob.

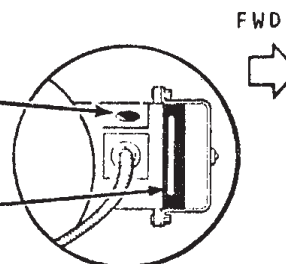
A red dot visible through the eyepiece indicates that the power supply and lights of the optical viewer are serviceable.

The bright line (white) indicates that the landing gear is down and locked.

<u>EMERGENCY RELEASE OPERATION</u>			
1-MOVE OPEN INDEX ON KNURLED KNOB TO RED LINE			
2-REMOVE PIN FROM BELLCRANK			
3-OPERATE BELLCRANK TO RIGHT HAND BY USE OF CONTROL LEVER			
4-CHECK DOWNLOCK VISUAL INDICATION			
<u>UNLOCKED</u>		<u>LOCKED</u>	
	RED		RED
			WHITE
5-IF DOWNLOCK IS NOT OBTAINED USE PNEUMATIC AID (LOCATED BETWEEN TWO CENTRE CROSSBEAMS)			

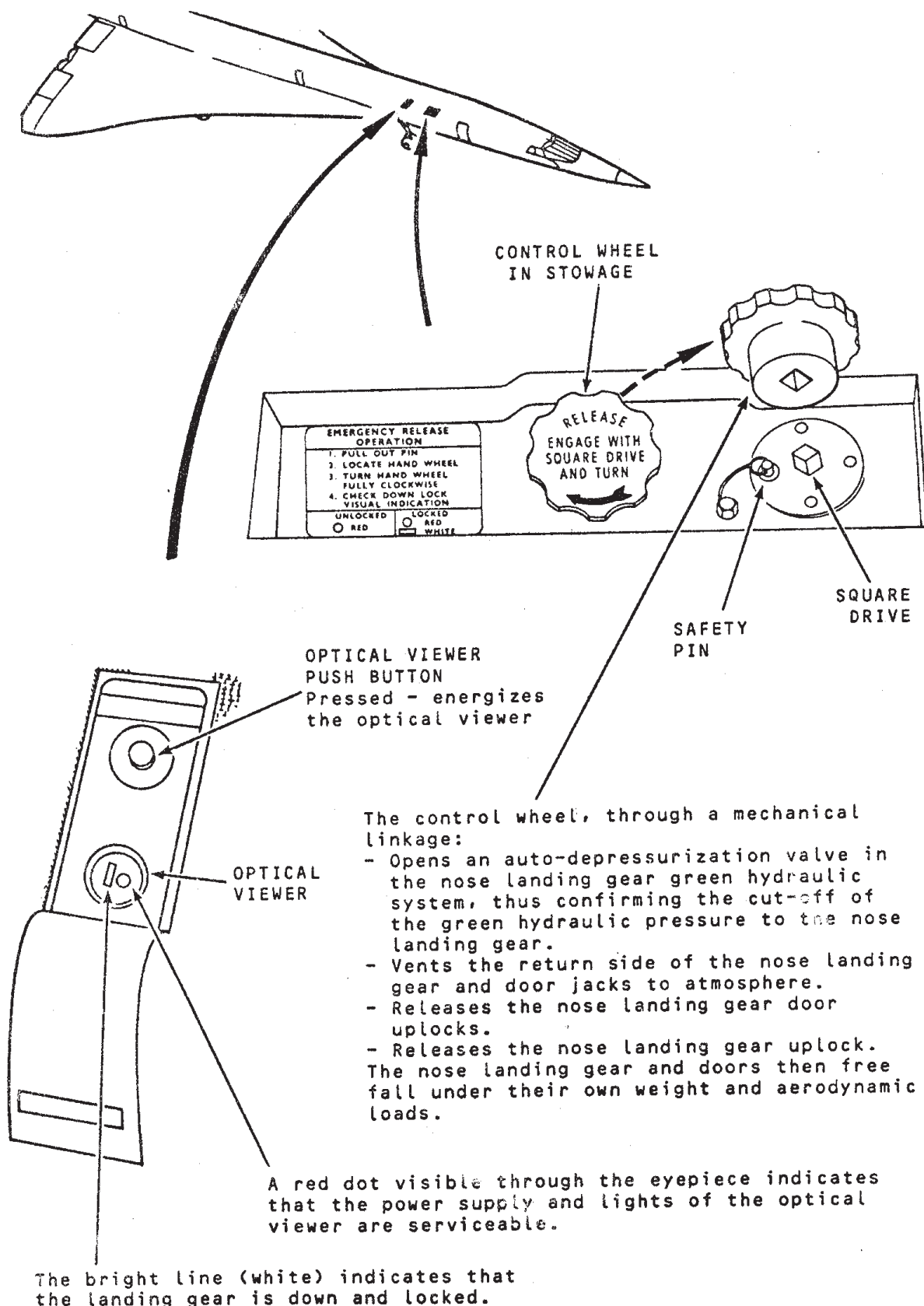
PLACARD

On underside of access panel.

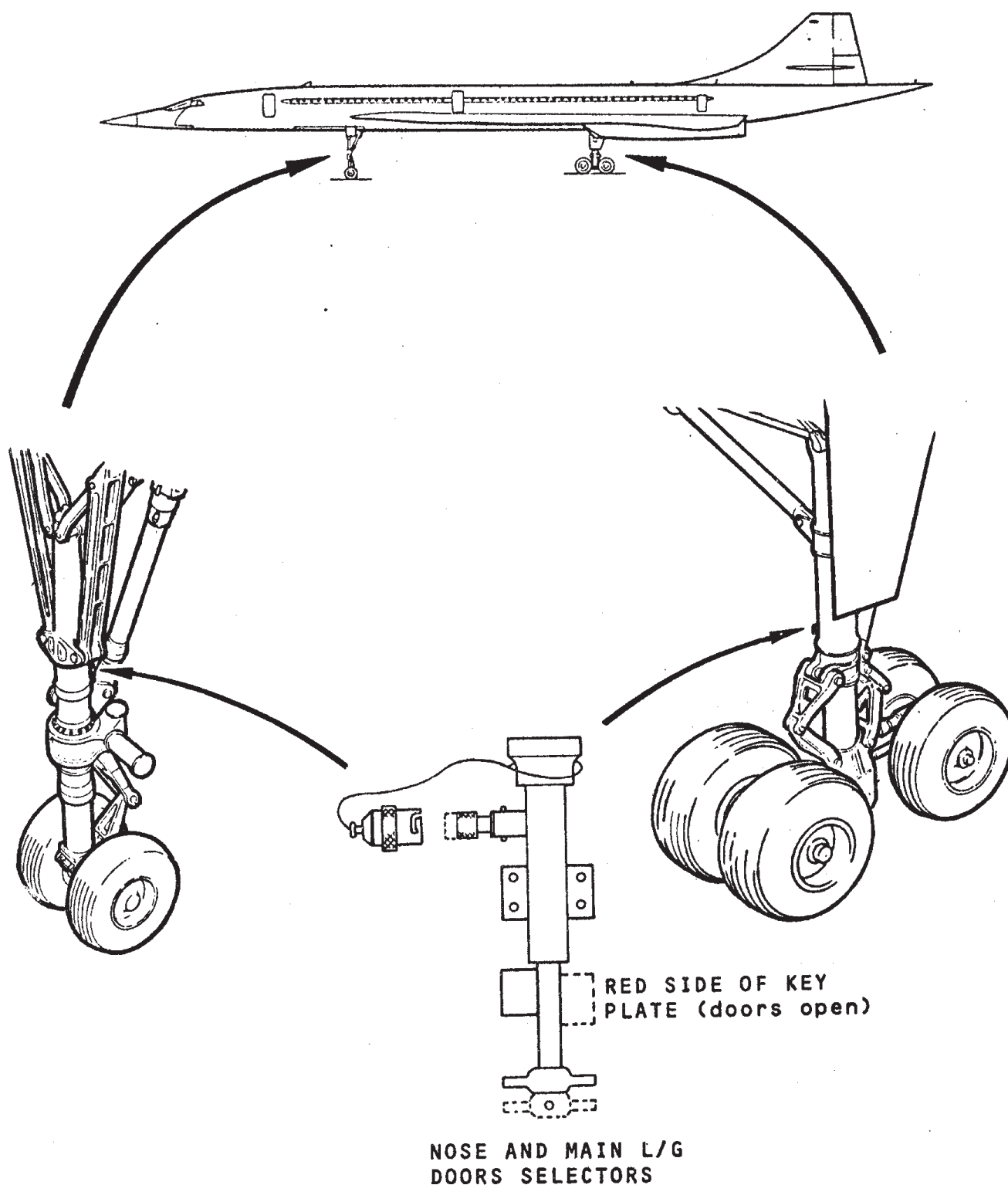


VIEW THROUGH EYEPIECE

NOSE GEAR FREE FALL

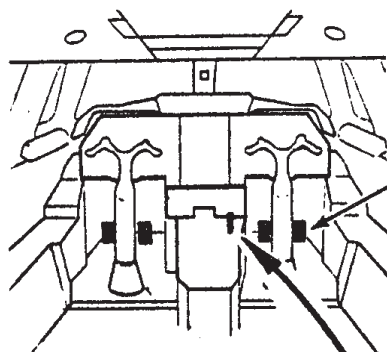


DOORS



With landing gear lever at DOWN, visor down and green system pressurized, both main landing gear doors can be opened simultaneously on the ground by a selector located on the LH gear leg. Nose landing gear doors can be opened by a selector on the nose gear leg.

BRAKES LEVER



BRAKE PEDAL (4)

BRAKES LEVER

NORMAL POSITION

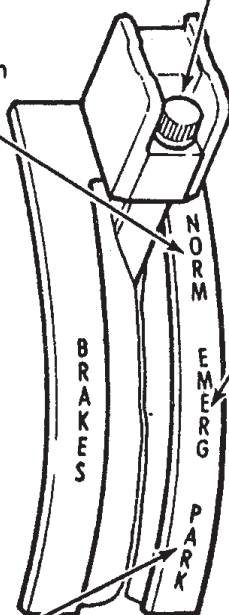
NORM - full anti-skid braking is selected powered by the green hydraulic system or by the yellow hydraulic system if the yellow rotary selector on the servo control panel is set to YELLOW/GREEN and green hydraulic system pressure is low.

LEVER RELEASE BUTTON

A baulk on the brakes lever prevents continuous movement from NORM or EMERG to the PARK position. To override the baulk the release button on the lever knob must be depressed.

NOTE

All movement of the brakes lever between NORM and EMERG in both directions should be made firmly and without hesitation as there is a position between NORM and EMERG where all hydraulic power to the brakes is removed.



EMERGENCY POSITION

EMERG - braking is powered by the yellow hydraulic system but no anti-skid is available.

NOTE

When the brake lever is moved from PARK there is no positive latching at EMERG. Selection of EMERG should therefore always be made from NORM.

PARK POSITION

PARK - the brakes are applied with pressure from the brakes accumulator.

CAUTION

With the aircraft moving PARK should only be used if absolutely necessary. No modulation of the brake pressure is available, because at PARK all available brakes accumulator pressure is delivered to the brakes.

BRAKING CONTROL AND INDICATION

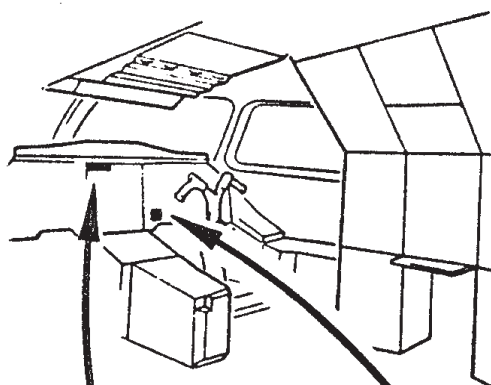
(SHEET 1 of 2)

R LIGHT (White) (8)

Armed when the landing gear is down and locked.

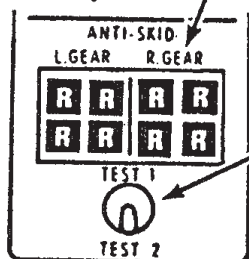
On - indicates that the corresponding brake anti-skid is released.

Off - indicates that the corresponding brake anti-skid is not released.



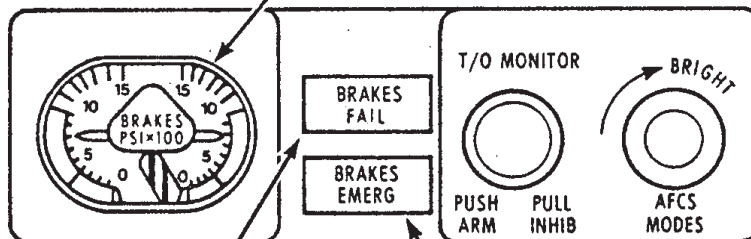
ANTI-SKID SYSTEM TEST SELECTOR

TEST 1 and TEST 2 are continuity checks of the two channels for aircraft speed detection and the anti-skid units.



DUAL BRAKES PRESSURE GAUGE

Displays only the emergency and parking brakes pressure. The left and right-hand gauges refer to left and right hand gear wheel brakes. A red and black flag indicates loss of gauge power supply.



BRAKES FAIL LIGHT (Red)

On - indicates a low hydraulic pressure condition in the normal brakes system.

The warning is only armed when the brake pedals are depressed.

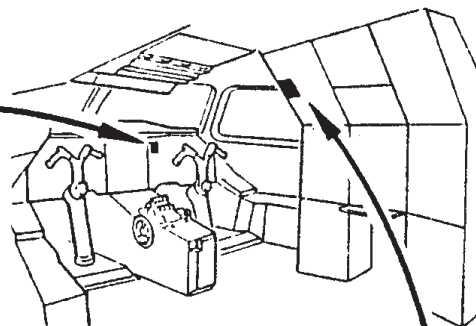
BRAKES EMERGENCY LIGHT (Amber)

On - indicates the brakes lever is not at the NORM position.

BRAKING CONTROL AND INDICATION
(Sheet 2 of 2)

WHEELS O/HEAT LIGHT (Red)

On - indicates a brake temperature exceeding 220 deg C.



BRAKES OVERLOAD MI

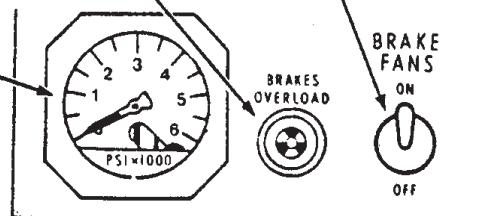
⊗ Cloverleaf (White) with brake lever at NORM - indicates an overtorque condition has triggered safety circuits to inhibit normal operation of affected brake units. Resetting the safety circuits to restart normal brake operation may be performed by Flight Crew action but the MI will indicate an overtorque condition until reset at the brake adaptor unit.

BRAKE FANS SWITCH

ON - the eight brake fans operate providing that the landing gear is down.

BRAKES ACCUMULATOR PRESSURE GAUGE

A red and black striped flag indicates loss of electrical power supply of the accumulator pressure gauge.

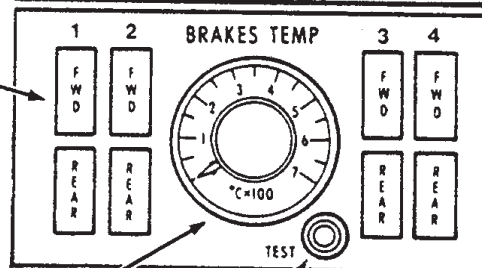


BRAKES TEMP FWD AND REAR LIGHT (Red) (8)

On - indicates that the corresponding brake temperature exceeds 220 deg C.

Accompanied by the WHEELS O/HEAT light.

Pressed - causes the BRAKES TEMP gauges to indicate the temperature of the associated brake.



BRAKES TEMP GAUGE

Displays the highest brake temperature or if a BRAKES TEMP light is pressed, the temperature of the associated brake.

BRAKES TEMP TEST PUSH BUTTON

Pressed - tests the wheel overheat warning system by adding 270°C to the gauge reading.

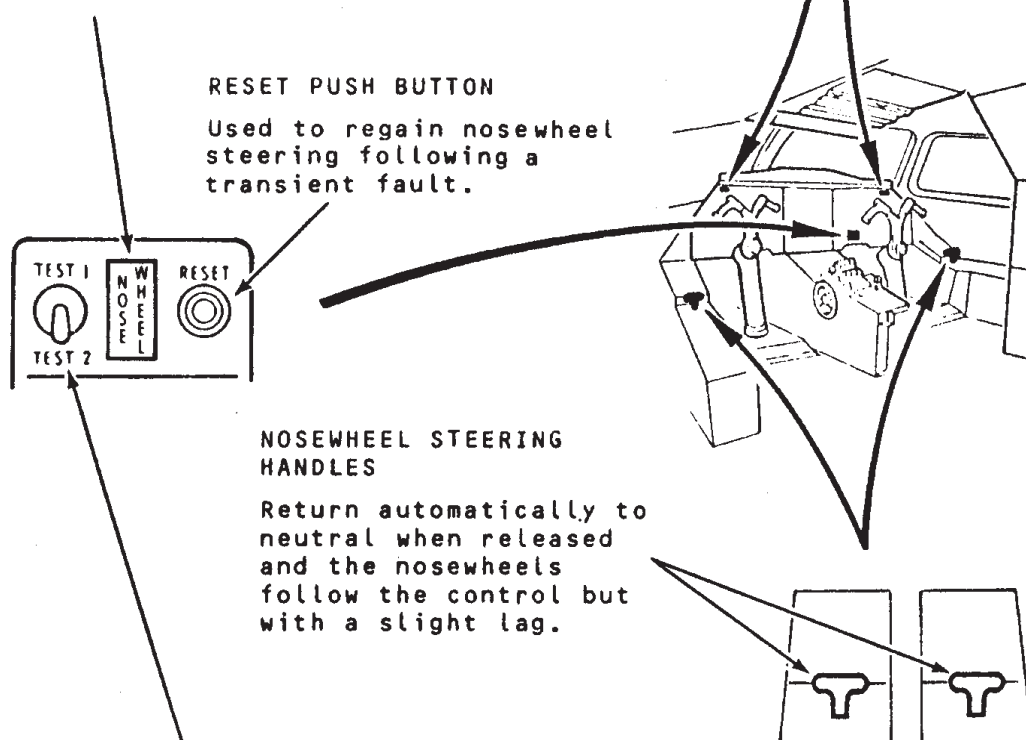
STEERING CONTROL

NOSEWHEEL LIGHT (Red) and STEERING LIGHT (Red) (2)

Armed only while the aircraft is on the ground. On - indicates that the nosewheel steering has been inhibited by the monitoring system. The monitoring system covers loss of hydraulic pressure to the nosewheel steering, discrepancy between the control input and the monitoring system and operation of the steering isolate switch. The system will remain inhibited until the fault is cleared and the system is reset using the RESET push button.

STEERING LIGHT (Red)

STEERING



NOSEWHEEL TEST SELECTOR

TEST 1 - tests operation of the first monitoring channel of the nosewheel steering electric control which monitors discrepancies that may arise between the steering handle control input signal and wheels position.

TEST 2 - tests operation of the second monitoring channel of the nosewheel steering electric control which detects nosewheel steering runaway.

Each monitoring channel is associated with a shut-off valve which, when de-energized, inhibits the control by cutting hydraulic pressure.

When the nosewheel test selector is released it resets the nosewheel control system.

SAFETY PINS

GROUND ENGINEER'S
INTERPHONE BOX

NOSEWHEEL STEERING
CONTROL LEVER

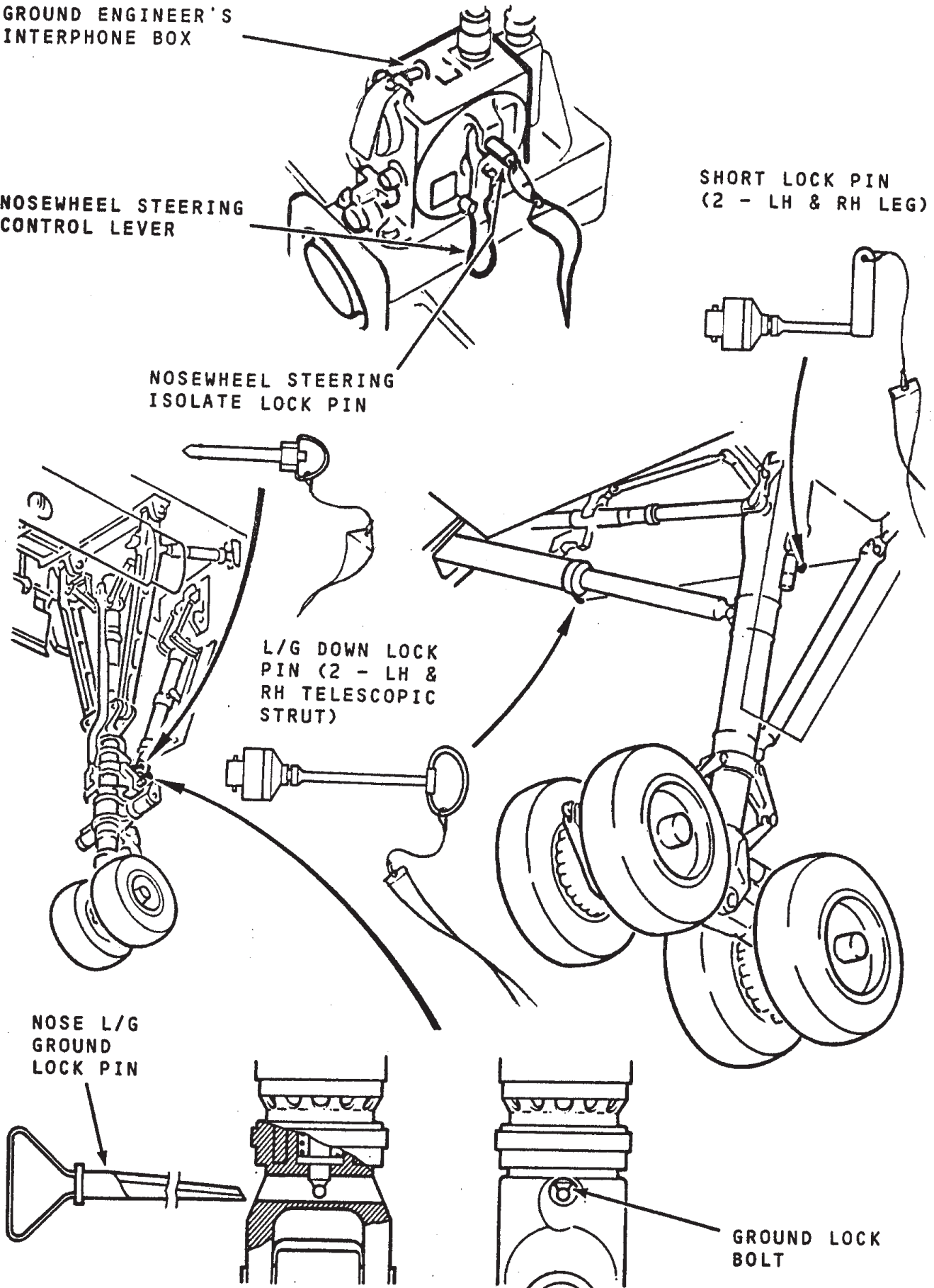
SHORT LOCK PIN
(2 - LH & RH LEG)

NOSEWHEEL STEERING
ISOLATE LOCK PIN

L/G DOWN LOCK
PIN (2 - LH &
RH TELESCOPIC
STRUT)

NOSE L/G
GROUND
LOCK PIN

GROUND LOCK
BOLT

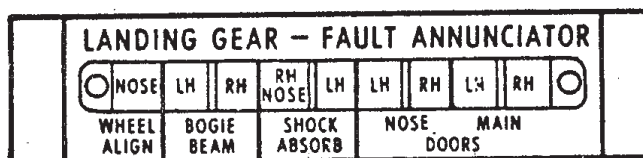
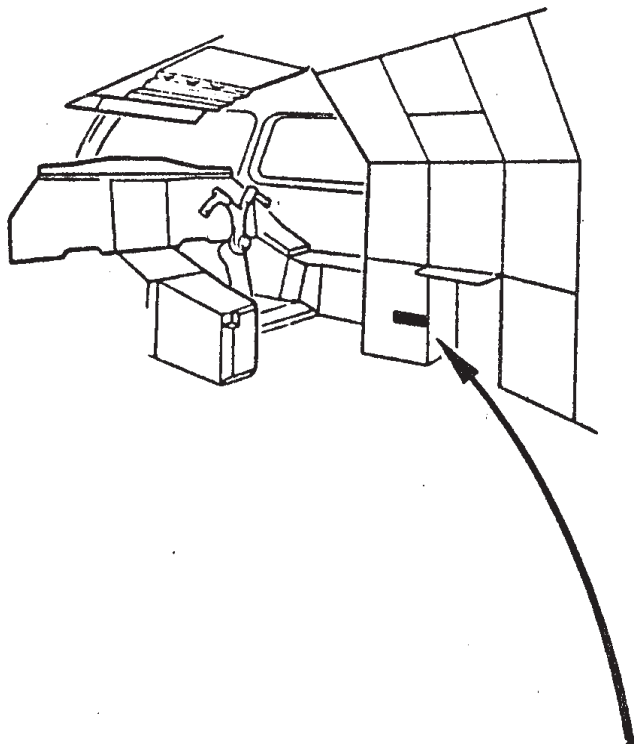


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LANDING GEAR

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FAULT ANNUNCIATOR PANEL



LANDING GEAR FAULT ANNUNCIATOR

The lights energized only when the L/GEAR lever is set to UP except LH SHOCK ABSORB which is also energized with the selector at NEUTRAL.

(Unchanged)

Chapter 15

**NAVIGATION
SYSTEMS**

(ATA CHAPTER 34)

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NAVIGATION

GENERAL

The navigation system includes those items that provide position and direction data to the flight crew. The system includes both ground dependent and independent position indicating systems.

AIR DATA SYSTEM

Two separate and independent air data systems are supplied by two air data computers, ADC 1 and ADC 2.

The air data computers receive input signals from the following:

	ADC.1	ADC.2
Total Pressure	Located on left hand side of droop nose; Pitot Probe (PO3)	Located on right hand side of droop nose; Pitot Probe (PO2)
Incidence (Local)	Sensor No.1	Sensor No.2
Total Temperature	T _T Sensor No.1	T _T Sensor No.2
Droop Nose Angle	Transmitter Unit Output A	Transmitter Unit Output B
Static Pressure	Cross connected Static ports S17 & S18 on left and righthand side of main fuselage.	Cross connected Static ports S16 & S19 on right and lefthand side of main fuselage.
Aircraft Weight	FQI Panel CG Channel Selector	FQI Panel CG Channel Selector

Each ADC has a built-in servo monitor system which checks the servo channel operation for altitude, airspeed, Mach number, temperature, vertical speed and incidence.

A comparator system compares the altitude, airspeed, Mach number and incidence outputs for the ADC's.

ADC 1 supplies the Captain's dash panel instruments and the Flight Engineer's Machmeter (see chapter 10), all No.1 automatic systems as detailed overleaf, the N₁ limiter of engine 4, the secondary air doors and ground idle control of engines 1 and 4, the ground proximity warning system, No.1 ATC transponder and INS 1 and 3.

ADC 2 supplies the First Officer's dash panel instruments and the Flight Engineer's Altimeter (see chapter 10) all No.2 automatic systems as detailed overleaf, the secondary air doors and ground idle control of engines 2 and 3, No.2 ATC transponder and INS 2.

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NAVIGATION

SUMMARY OF ADC OUTPUTS

	MACH NUMBER	ALTITUDE	AIRSPEED	TRUE AIRSPEED	VERTICAL SPEED	INCIDENCE	TOTAL TEMPERATURE	STATIC TEMPERATURE	M _{MO}	V _{MO}	AIRSPEED - V _{MO}	V _{LA}
INSTRUMENTS	*	*	*		*	*	*	*	*	*		
POWERED FLIGHT CONTROLS			*								*	
AUTOSTABILIZATION	*											
SUPER STABILIZATION			*			*						
ARTIFICIAL FEEL	*		*			*						
TRIM	*		*			*					*	
STICK SHAKER						*						*
AUTOPILOT	*	*	*		*						*	
AUTO THROTTLE	*		*									
A.T.C. TRANSPONDER		*										
I.N.S.		*		*								
GROUND PROXIMITY WARNING					*							
OVERSPEED WARNINGS	*		*				*				*	
C.G. & MACH LIMIT WARNINGS	*										*	
AIDS	*	*	*			*	*	*				*
ANTI ICING							*					
SECONDARY AIR DOORS	*		*									
NASU	*							*				
GROUND IDLE			*									
N ₁ LIMITER ENGINE 4			*									

NAVIGATION

INERTIAL NAVIGATION SYSTEM

Three separate and independent inertial navigation systems INS 1, INS 2 and INS 3 provide navigation, heading and attitude information.

Normally INS 1 supplies data to the left dash panel and AFCS 1, while INS 2 supplies data to the right dash panel and AFCS 2. INS 3 can supply attitude data to the left or right dash panel by operation of the ATT-INS switches but cannot supply data to either AFCS. Each INS has an associated control module located on the centre console which provides facilities for obtaining current navigation data in digital display form and is also used for loading desired route data.

INS 1 and 2 supply steering commands to AFCS 1 and 2 respectively, to provide automatic navigation when the auto pilot is selected to the INS mode.

Alignment of the inertial platform takes approximately 15 minutes and is initiated by means of the mode selector unit. There is one MSU for each INS and these are located on the Flight Engineer's panel. Once the selector has been set to NAV mode the MSU is not operated unless a failure of the INS occurs.

The INS is continuously self-monitored during flight and a comprehensive system of warning indications is provided, including action and malfunction codes obtainable from the control modules.

External monitoring is provided by a comparator which protects the AFCS against undetected INS failures. This comparator compares signals which the INS send to the AFC systems. The comparator unit examines the outputs from the three inertial platforms and also compares attitude on each ADI with the other and heading on each HSI with the other. At all times above 600 feet the comparator looks at pitch and roll attitude outputs from all three platforms and uses voting logic to decide which platform is faulty in the event of any significant discrepancy. Below 600 feet with LAND or GLIDE selected the comparator reduces the detection threshold on pitch and roll attitude discrepancy and, in addition, looks at vertical acceleration and heading outputs from the INS and course settings on the AFCS.

A comparator warning will normally cause disconnection of the associated AFCS as well as indicating the failed INS. In the case of an attitude failure in INS 1 or INS 2, the sphere in the associated ADI will tilt 90° pitch down, providing the ADI comparison threshold has been exceeded and INS 3 is providing valid attitude data.

In comparing attitude and heading on the ADIs and HSIs of the Captain and First Officer the comparator unit generates a warning when they differ from each other by more than 4°. This monitoring is effective at all times and the detection level is slightly tighter than that for INS attitude monitoring above 600 feet.

NAVIGATION

In case of failure of INS 1, the Captain can select his NAV-INS switch to INS 2 to regain navigation display on his HSI. Similarly the First Officer can switch his HSI to INS 1.

RADIO NAVIGATION

Duplicated radio navigation systems provide bearings of a VOR or ADF beacon, distance to a DME beacon and localiser and glide slope indications.

In normal operation No.1 compass coupler system feeds the Captain's ADF-RMI and the First Officer's VOR-RMI and No.2 compass coupler system feeds the Captain's VOR-RMI and the First Officer's ADF-RMI.

HORIZONTAL SITUATION INDICATOR

The Horizontal Situation Indicator displays commands from three sources, VOR, ILS and INS. Input source to each HSI is controlled by a RAD/INS switch.

RADIO ALTIMETER

Two independent radio altimeters provide low altitude information in the height range from 0 to 2500 feet. The radio altimeter is used with the automatic landing system and low altitude flight systems. To ensure the best possible integrity of the system, a monitoring system checks the system three times per second.

Height information, from No.1 system is supplied to the Captain's radio altimeter, the First Officer's ADI and No.1 autopilot, and from No.2 system is supplied to the First Officer's radio altimeter, the Captain's ADI and No.2 autopilot.

The decision height is adjustable and visual and aural warnings are given at the selected height.

GROUND PROXIMITY WARNING SYSTEM

A single Ground Proximity Warning System provides warning of impending collision with terrain. The system uses inputs of radio altitude and vertical speed, plus glideslope deviation during approach, to provide five different modes of protection.

1. Excessive rate of descent with respect to terrain.
2. Excessive closure rate with terrain.
3. Loss of altitude below 700 feet after take off.
4. Proximity to ground with aircraft not in landing configuration.
5. 'Duck under' the glideslope.

For modes 1, 2, 3 and 4 the warning takes the form of a flashing red TERRAIN light on the captain's and first officer's panels plus an aural warning - "Whoop, Whoop, Pull-Up" from the audio warning

NAVIGATION

system.

For mode 5 the warning is aural only; this is independent of the other aural warning and says "Glide-Slope".

Both aural warnings are repeated until the aircraft is out of the hazardous situation. However the repetition rate of the "Glide-Slope" warning is dependent on the degree to which the warning envelope is penetrated, the rate increasing as penetration deepens. In addition, a Mode 5 warning occurring above 300 feet is classified as 'soft' and the "Glide Slope" warning is attenuated. Below 300 feet, if a glideslope deviation of more than 2 dots fly-up is achieved, the "Glide-Slope" warning level is increased to add more urgency.

A 'soft' Mode 5 warning may be cancelled by pressing either TERRAIN switch-light. A 'hard' Mode 5 warning cannot be cancelled. Mode 5 may be inhibited before a warning occurs by pressing either TERRAIN switch-light when the aircraft has descended below 1000 feet.

A 'Pull Up' warning always overrides a 'Glide Slope' warning and cannot be cancelled. The Ground Proximity Warning System is inhibited by a 'Stall' warning.

MARKER BEACON SYSTEM

The pre-tuned marker beacon system provides visual and aural signals to the flight crew.

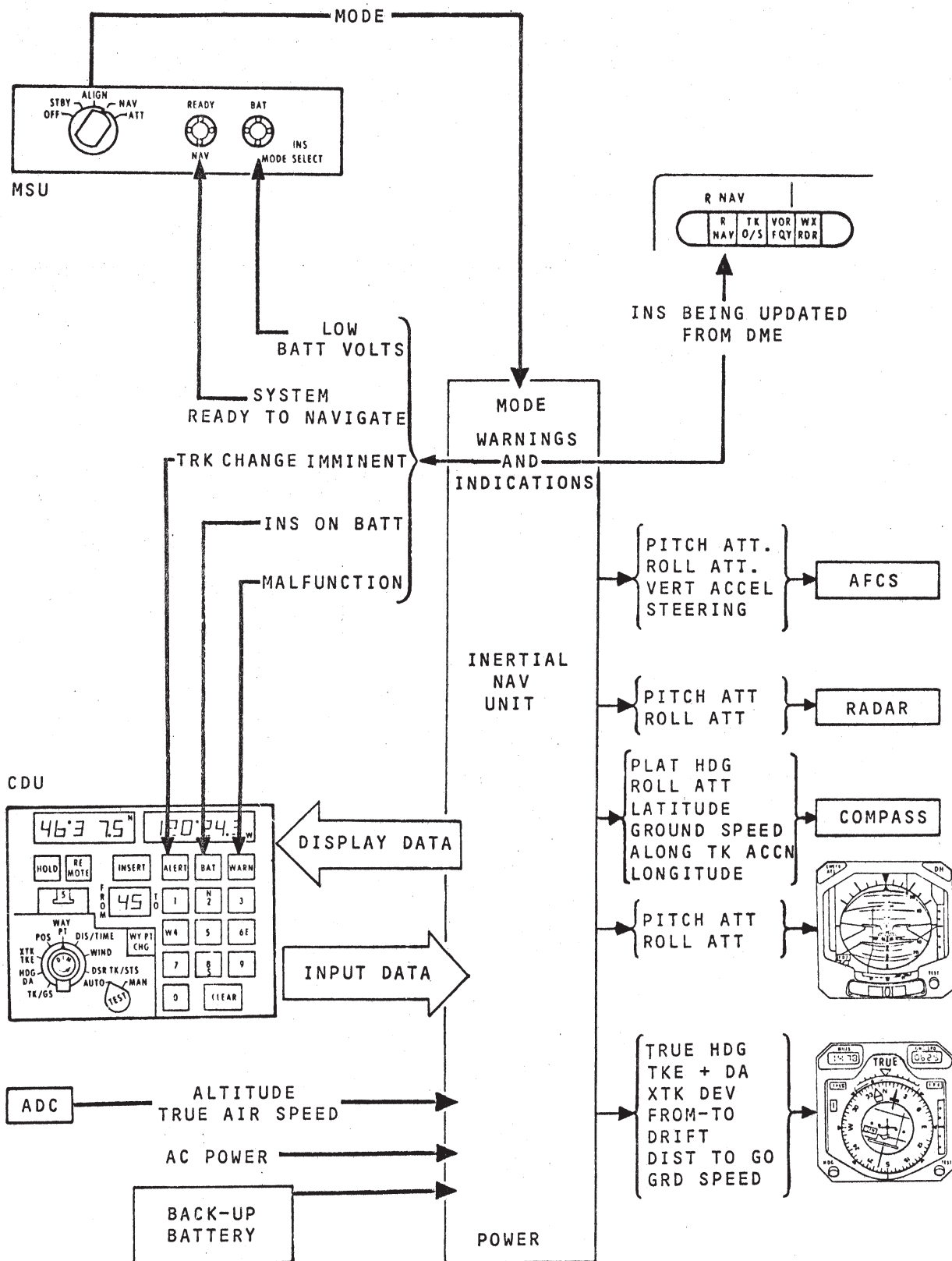
WEATHER RADAR

The weather radar system comprises duplicated radar displays and transceivers and a single radar antenna controlled through one control unit.

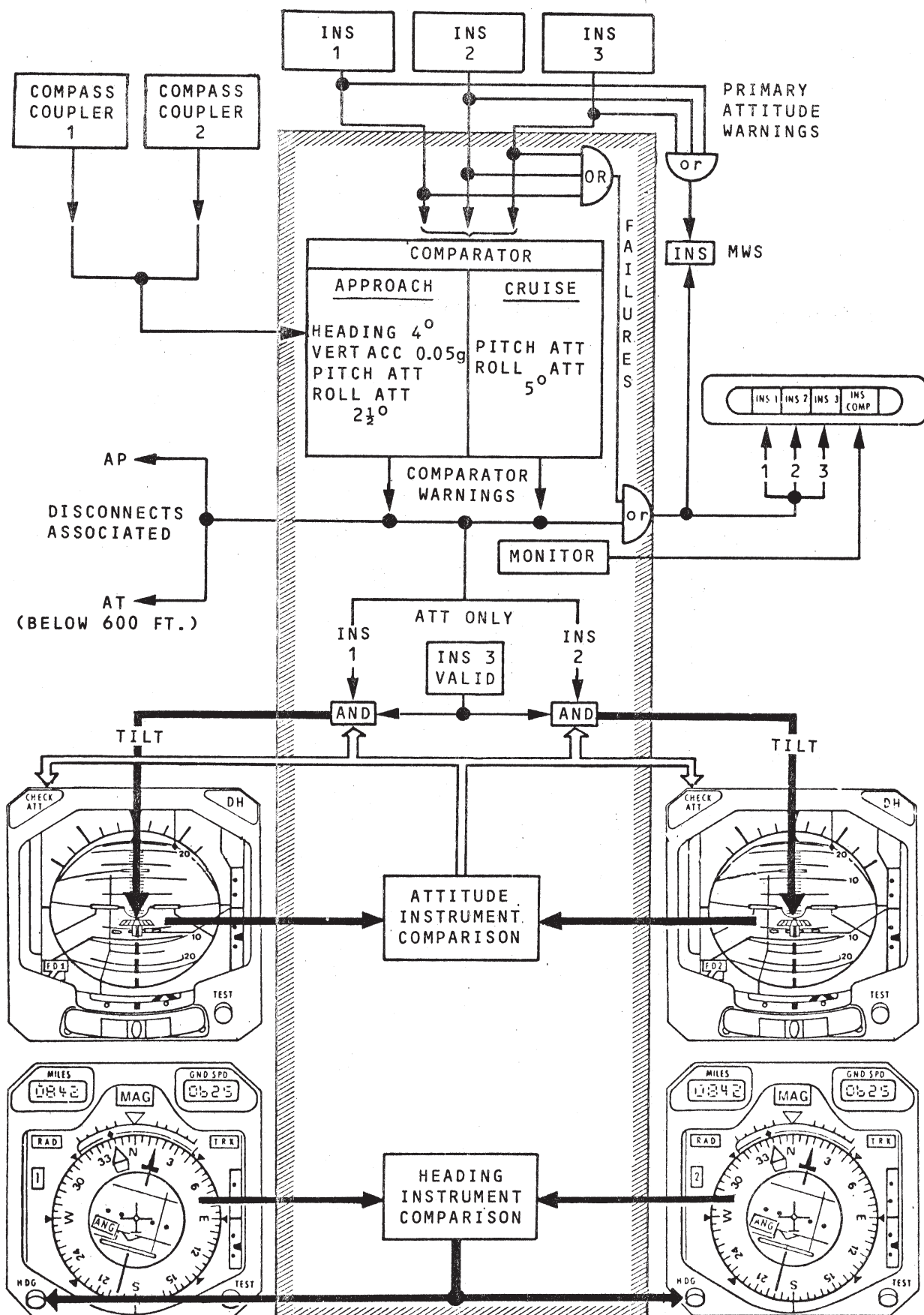
The weather radar system provides continuous information for weather observation or ground mapping within a 170 degree sector centred on the aircraft to a maximum range of 300 nautical miles.

The pre-selected tilt angle, the antenna tilt control is plus or minus 15 degrees, is automatically maintained during aircraft attitude changes by the INS and by a position transmitter during changes of droop nose angle.

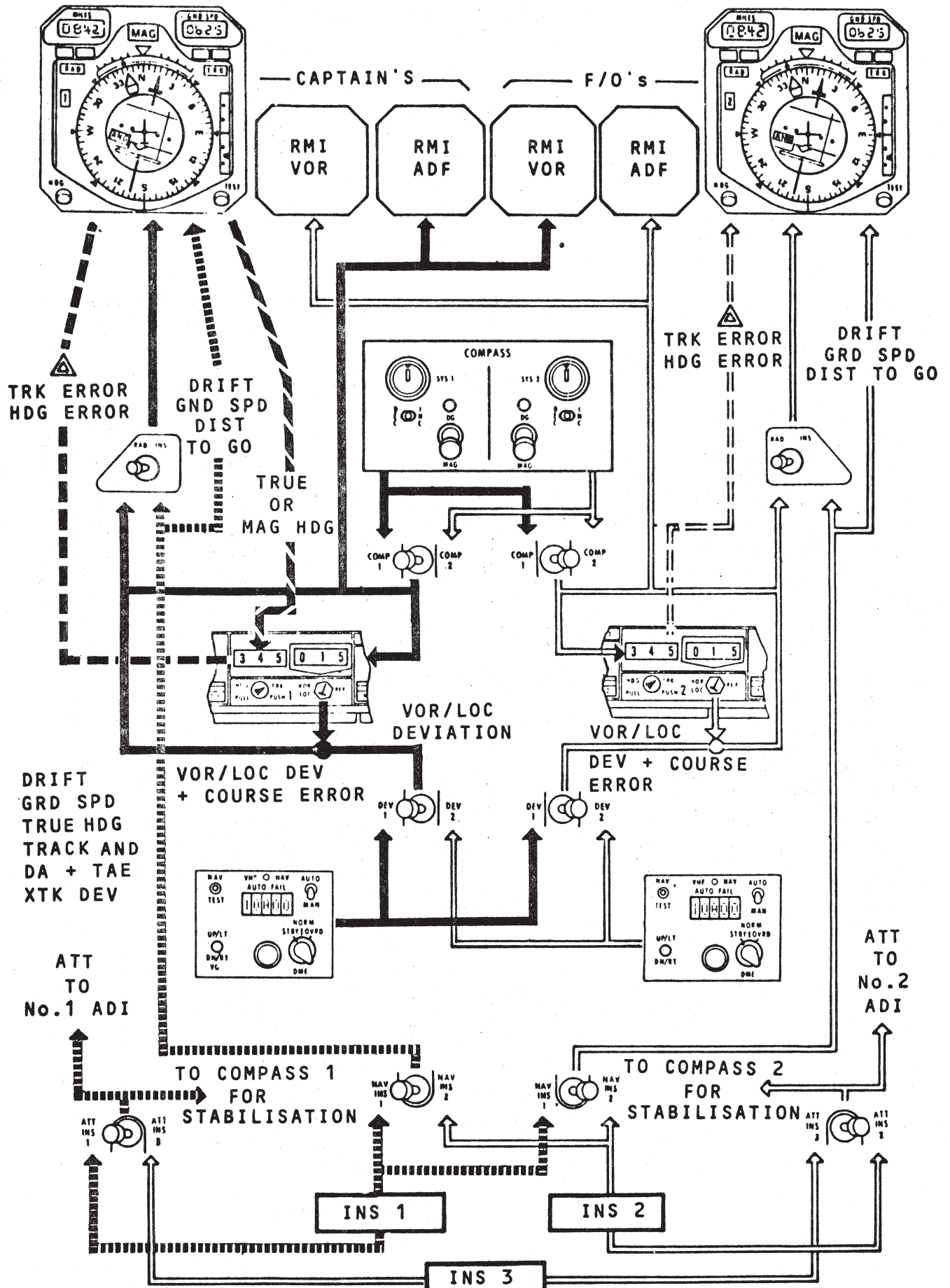
INERTIAL NAVIGATION SYSTEM



INERTIAL COMPARATOR WARNING



NAVIGATION SWITCHING

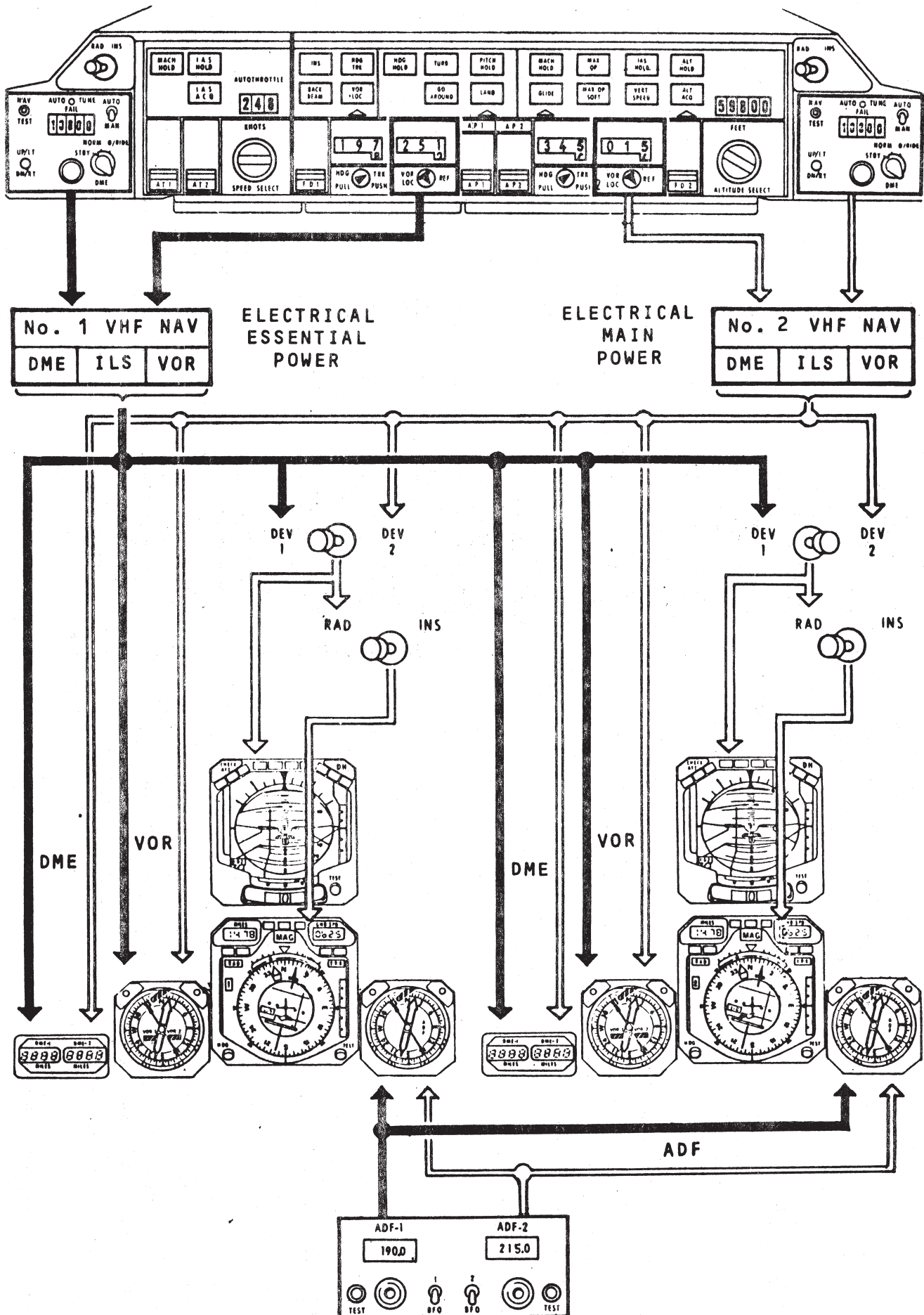


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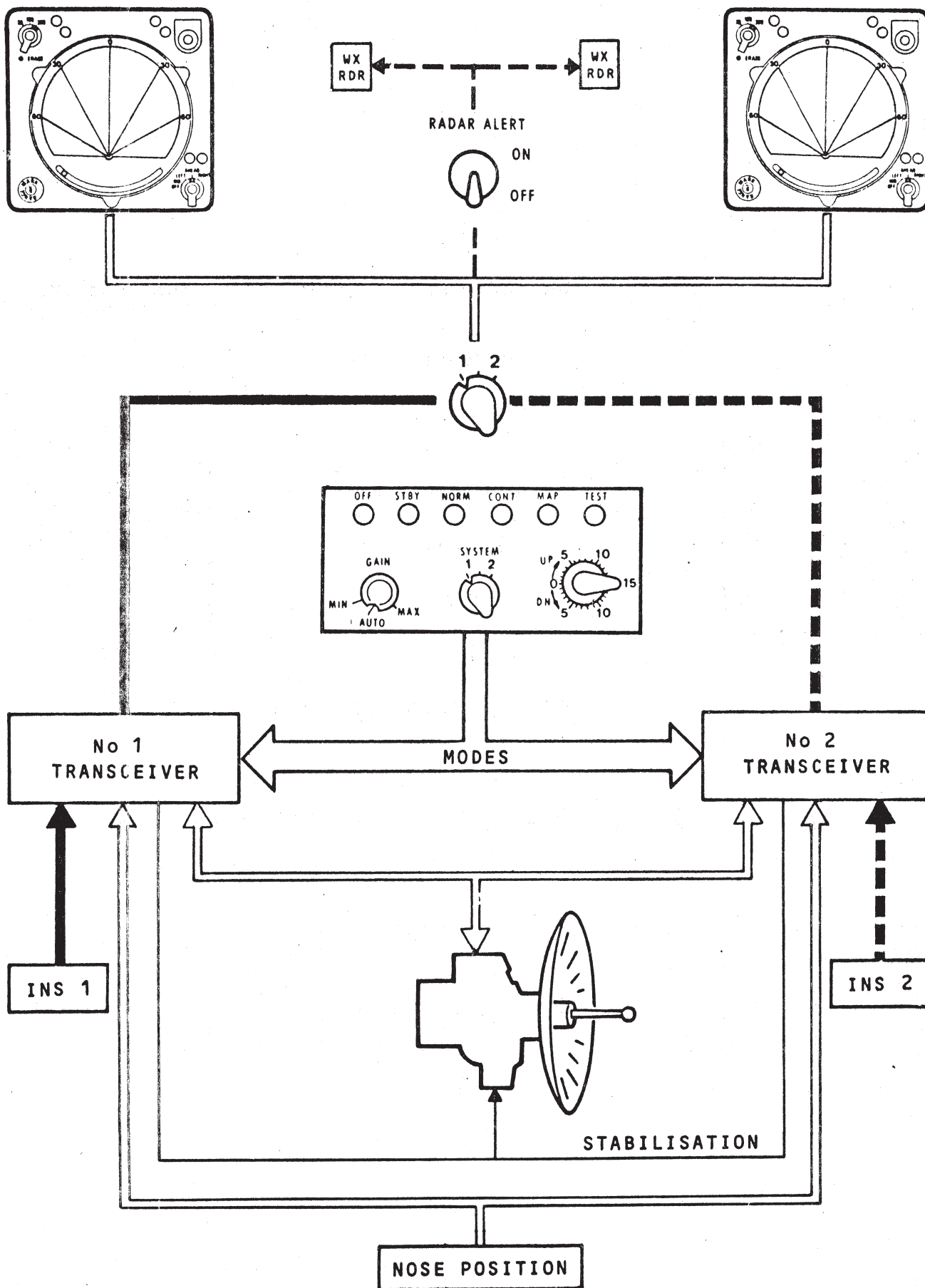
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RADIO NAVIGATION



WEATHER RADAR

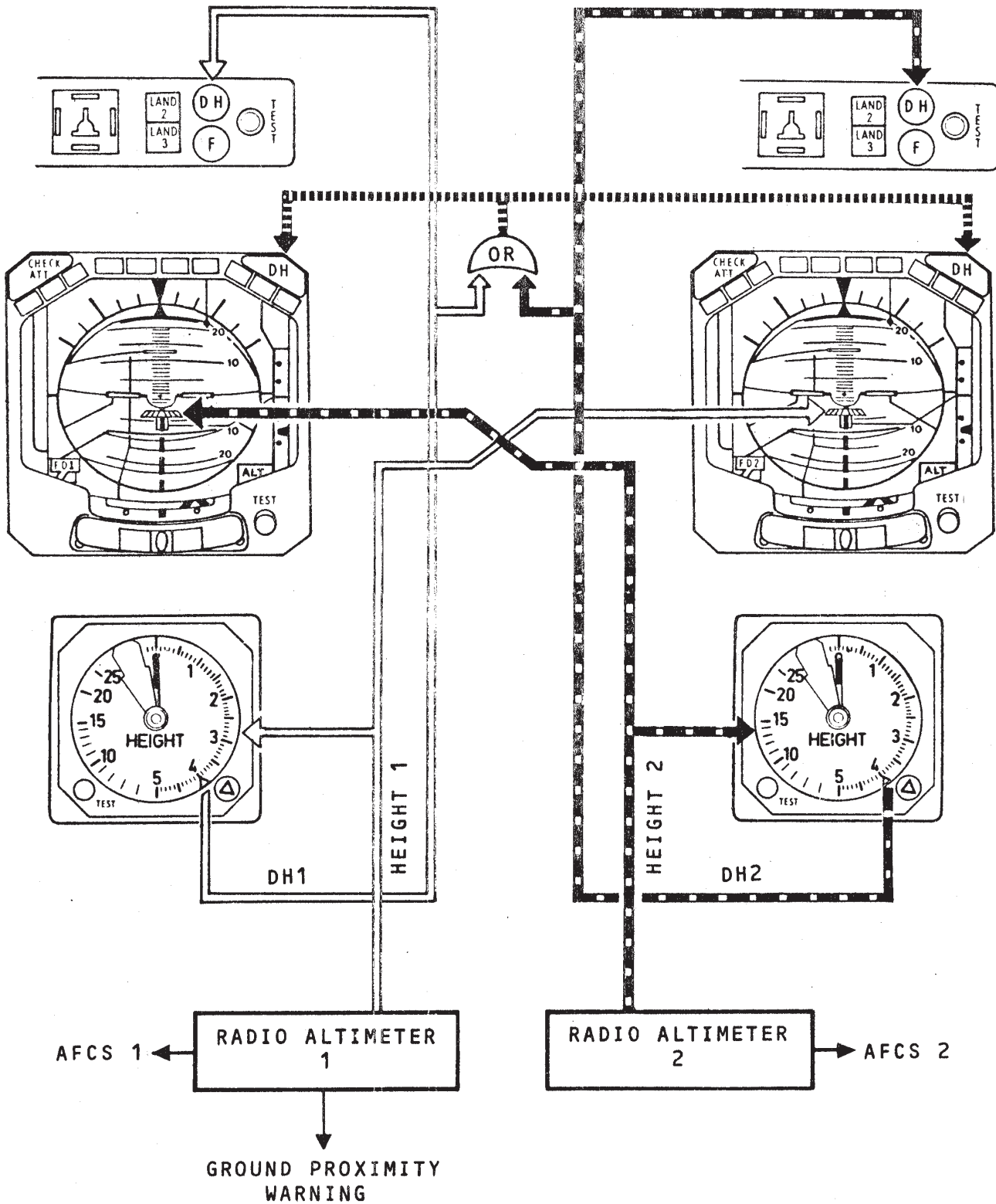


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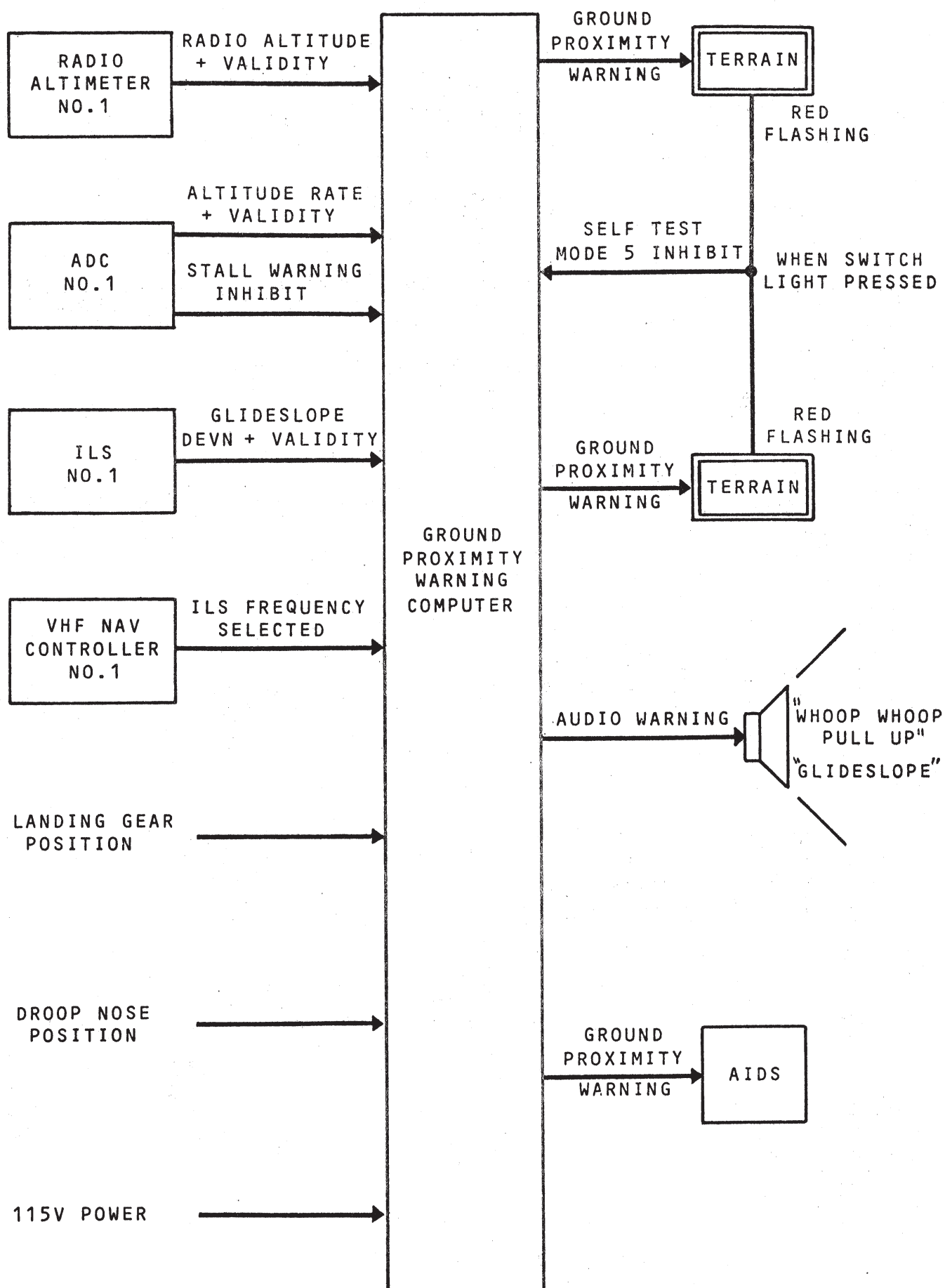
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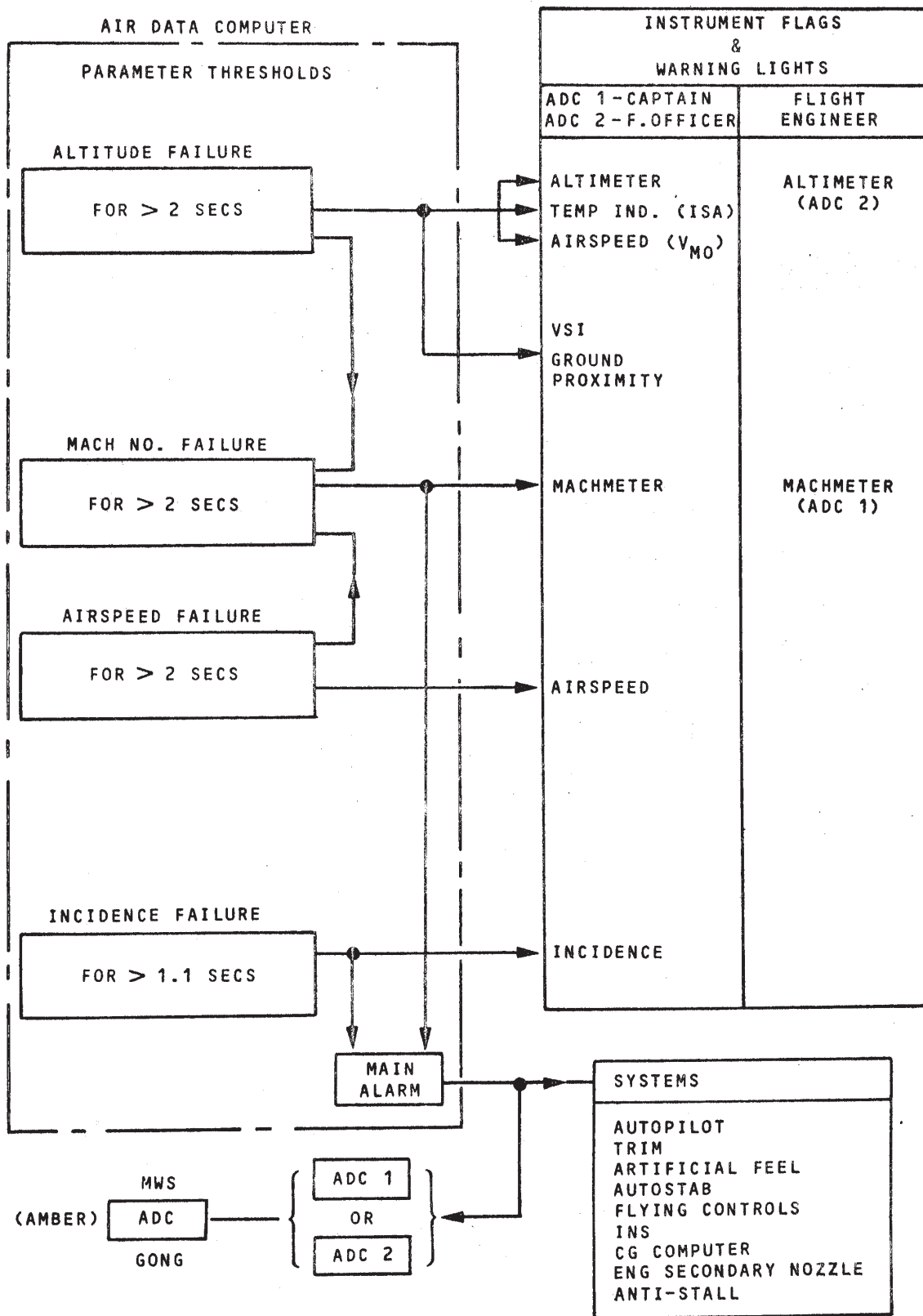
RADIO ALTIMETER



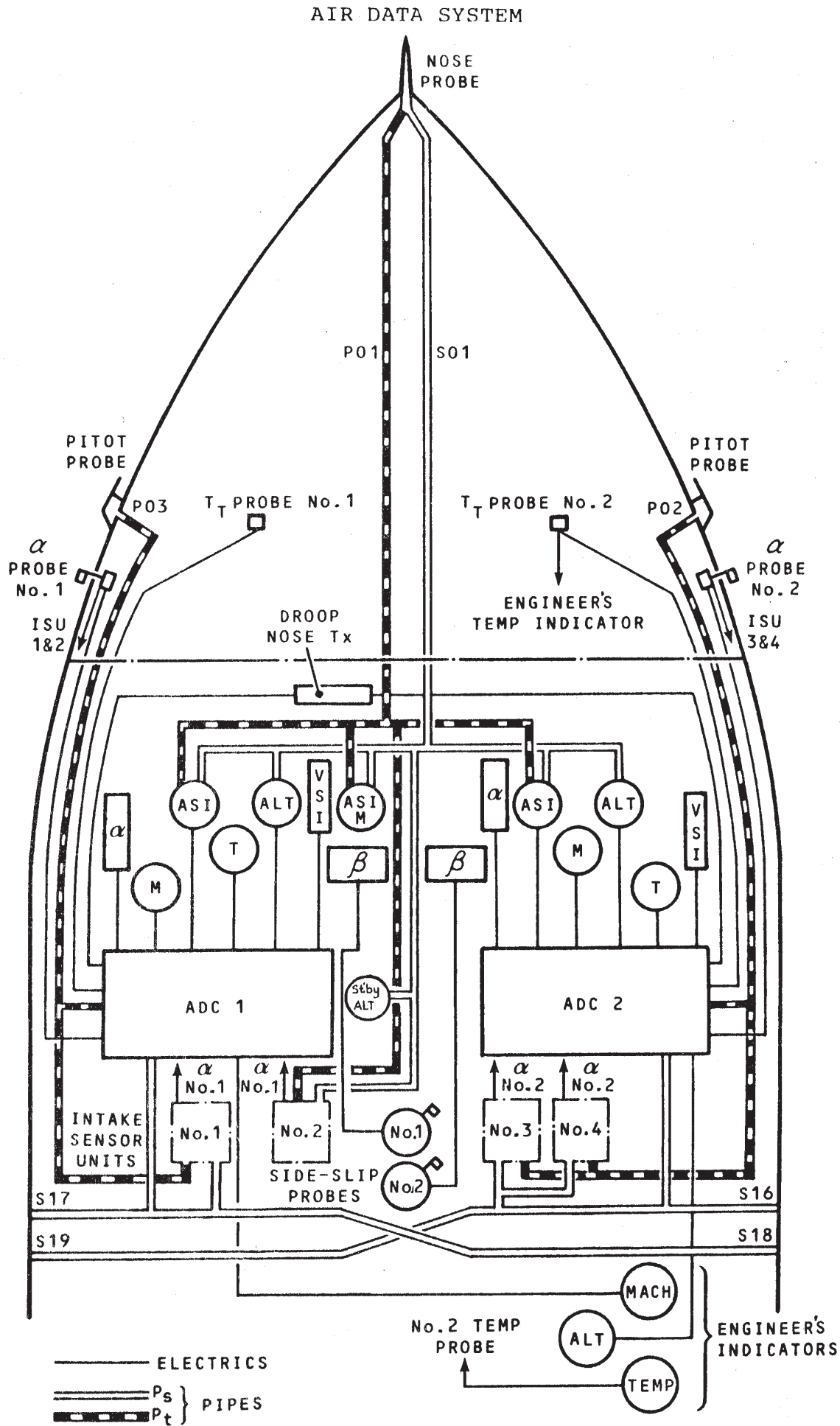
GROUND PROXIMITY WARNING SYSTEM



ADC FAILURE MONITORING



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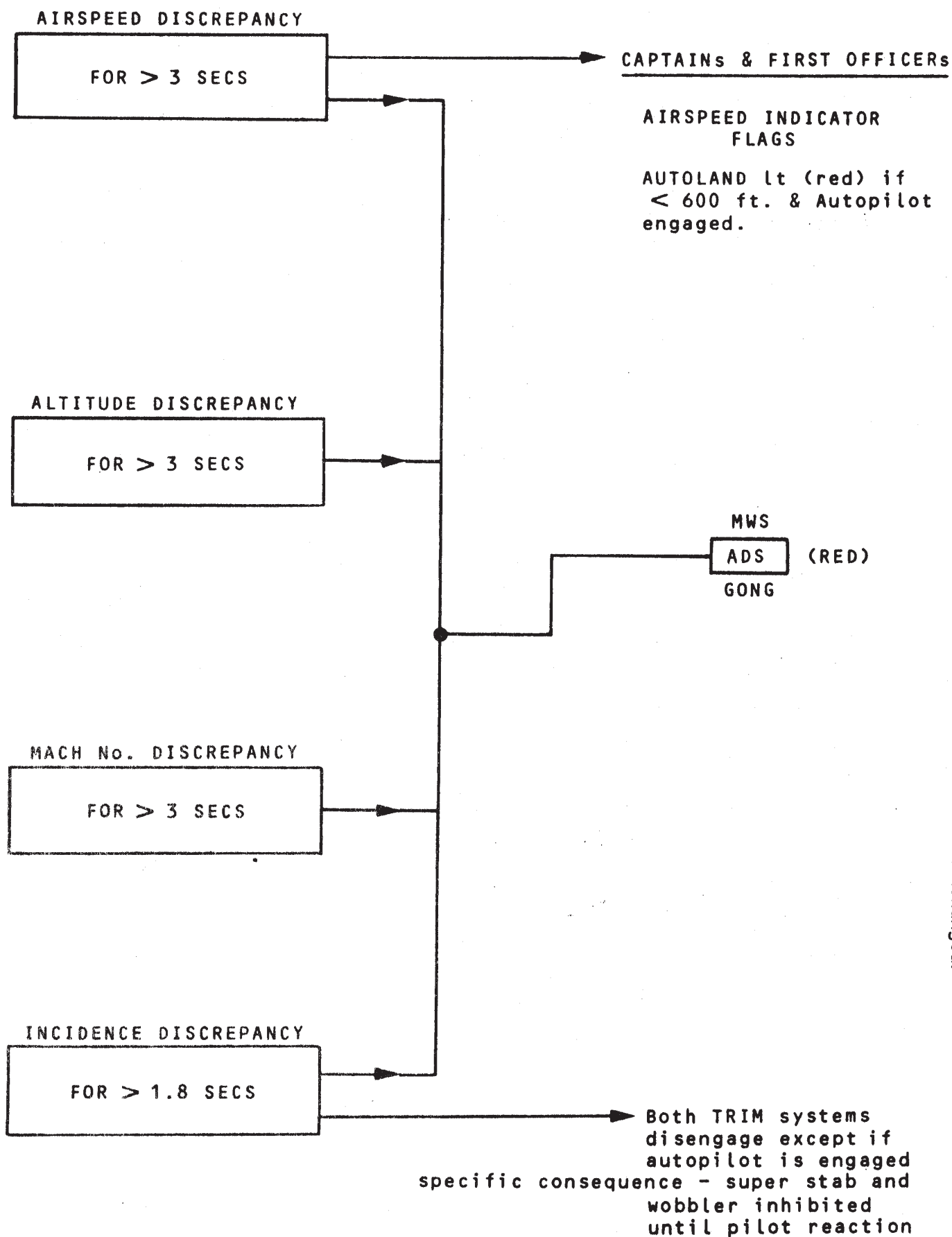


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ADS COMPARISON WARNINGS



(Unchanged)

AIR DATA SYSTEM

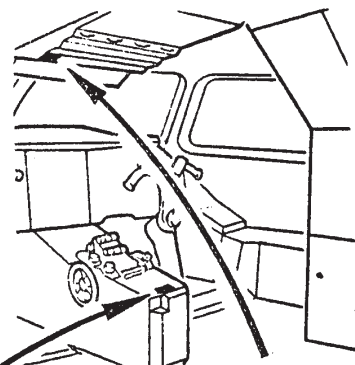
ADC 1 AND ADC 2 LIGHT (Amber)

On - indicates that the associated monitor system has detected a fault that has remained for two seconds or the power supply has been interrupted for more than one second.

The warning is locked on once activated.

Accompanied by the MWS ADC light (amber) and audio (gong).

Pressed - resets the monitor warning system thus allowing the warnings to disappear if the fault no longer exists.



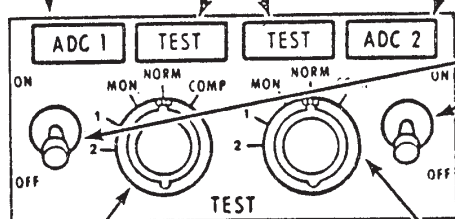
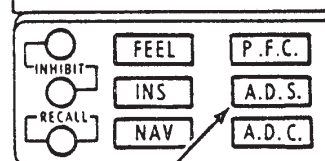
TEST LIGHT (Blue)

On - indicates the successful conclusion of a test selected on the TEST rotary selector.

Pressed - cancels the overspeed audio (warble) during tests.

MWS ADS LIGHT (Red)

On - indicates that a discrepancy has been sensed by the comparator system of both air data computers. Accompanied by audio (gong).



ADC SWITCH

ON - the air data computer is powered and the ADS/ENGINE PROBE HEATER failure indications are armed.
OFF - isolates the ADC and de-energizes the warnings.

ADC 1 TEST ROTARY SELECTOR AND ADC 2 TEST ROTARY SELECTOR

2 - tests the overspeed warning system by simulating an overspeed condition of V_{MO} , T_{MO} , M_{MO} , nose down and visor down. At the same time the relevant instruments and systems are driven to supersonic values.

Test 2 is only available on the ground.

1 - tests the stall warning system by simulating an excessive angle of attack.

At the same time the relevant instruments and systems are driven to subsonic values.

Test 1 is only available on the ground.

MON - tests the ADC monitoring system operation by simulating faulty conditions on some parameters.

At the same time the instruments show failure indications.

Test MON is only available on the ground.

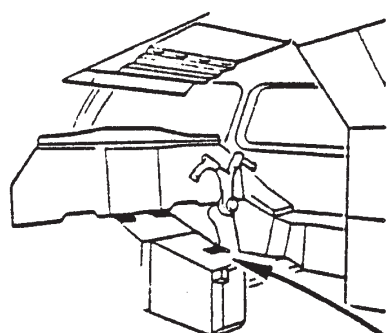
NORM - each air data system is supplied the following by its own ADC: pressure altitude, airspeed, Mach number, vertical speed, total temperature, static temperature, true airspeed and incidence.

COMP - tests the comparator system by simulating excessive differences between the outputs of the ADCs. Altitude, Airspeed, Mach No. & Incidence.

COMP test can be made with ADC 1 or ADC 2 TEST rotary selector.

(Unchanged)

INERTIAL NAVIGATION SYSTEM CONTROL MODULE
(Sheet 1 of 4)



ALERT LIGHT (Amber)

On - one minute before track change is due.
Flashing - when past waypoint in MAN mode when ground speed is in excess of 250 knots.
Off - when INS automatically switches to next navigation leg in AUTO mode.

REMOTE SWITCH LIGHT (Amber)

On - when pressed, permitting simultaneous loading and inserting of waypoint and DME station data in multiple system installations with a single control module.

RIGHT DATA INDICATOR

Displays longitude, ground speed, drift angle, track angle error, time, wind speed, or system status, as selected by the data selector. Frequency of DME station can also be displayed.

LEFT DATA INDICATOR

Displays latitude, track, heading, cross track distance, wind direction, or desired track as selected by the data selector. Altitude of DME station and the computer programme designation can also be displayed.

BAT LIGHT (Amber)

On - when system is operating on battery power.

INSERT SWITCH LIGHT (White)

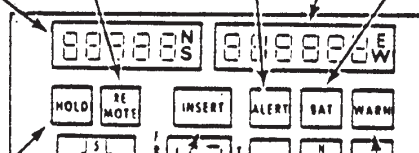
On - whenever the keyboard is armed.
Controls entry of keyboard data into the computer.

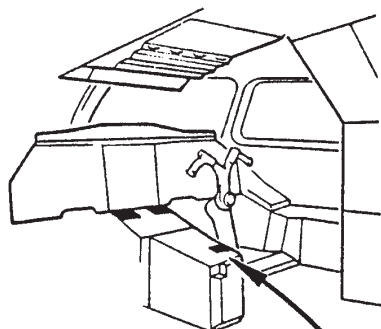
WARN LIGHT (Red)

On - when system self-check circuits detect an out of tolerance condition.

HOLD SWITCH LIGHT (White)

On - when pressed permits, in conjunction with other controls, freezing of displayed present position, to perform a manual position update, to display inertial present position, programme designation and recorded malfunction codes.



INERTIAL NAVIGATION SYSTEM CONTROL MODULE
(Sheet 2 of 4)

WAYPOINT/DME SELECTOR

Used in conjunction with WAY PT on the data selector. Selecting 1 through 9 determines the waypoints and DME stations for which data is to be inserted or displayed. Selecting 0 displays either the co-ordinates of the original departure point inserted during alignment, or the co-ordinates of the last manually inserted position update or course change.

FROM - TO INDICATOR

Indicates the flight leg for which navigation data is being computed. Automatically goes to 12 when system is turned on and waypoint data has been inserted. When keys 7 and 9, or 3 and 9 are pressed simultaneously, FROM indicator goes blank and TO indicator flashes number of DME station currently loaded.

DIM CONTROL

Used to vary the intensity of the following data displays:
left and right data indicators,
FROM/TO indicator,
ALERT light,
HOLD, REMOTE, INSERT
and WY PT CHG switches

WY PT CHG SWITCH

Allows different waypoint or DME station numbers to be loaded into FROM-TO indicator through the keyboard.

KEYBOARD (Buttons 0-9)

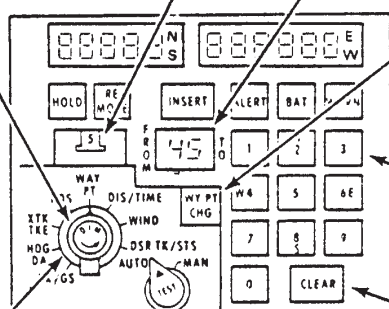
Used to load data into data indicators and to change numbers in FROM - TO indicators.

CLEAR SWITCH

Used to clear data indicators when erroneous data has been loaded.

DATA SELECTOR

Used to select data to be displayed in the data indicators.



TEST PUSH BUTTON/AUTO-MAN SWITCH

TEST:

Pressed - left and right data displays and FROM - TO indicator display all 8s.
HOLD, REMOTE, INSERT, ALERT, BAT, WARN and WY PT CHG lights on CDU and READY NAV and BAT lights on MSU are on. Digital displays on associated HSI read 0888 and R NAV light on associated dash panel is on.
When WARN light is on and data selector on DSR TK/STS, pressing TEST switch causes action code in right hand display. Further pressings of TEST switch causes malfunction codes to replace action code.

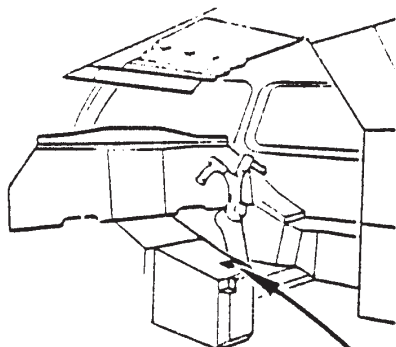
AUTO-MAN:

AUTO - the waypoint numbers in the FROM-TO indicator automatically sequence to the next flight leg when waypoint is reached.

MAN - the next flight leg number must be set manually through the keyboard.

(Unchanged)

INERTIAL NAVIGATION SYSTEM CONTROL MODULE
(Sheet 3 of 4)



WAY PT

Used with waypoint/DME selector and keyboard to insert and display waypoint and DME station data. Latitude or altitude in left data indicator; longitude or frequency in right data indicator. Also used to display inertial present position (see HOLD switch).

DIS/TIME

Distance to waypoint or DME station in TO indicator is displayed in left data indicator; time to waypoint in TO indicator is displayed in right data indicator.

POS

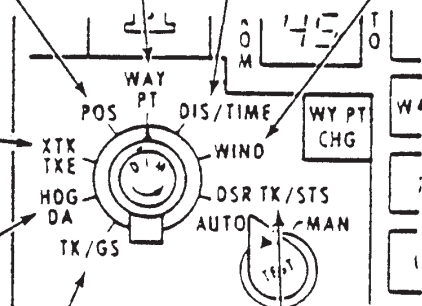
Position latitude displayed in left data indicator; longitude in right data indicator.

WIND

Wind direction displayed in left data indicator; wind velocity in right data indicator.

XTK TKE

Cross track distance (L or R) displayed in left data indicator; track error in right data indicator.



HOG DA

Airplane true heading displayed in left data indicator; drift angle in right data indicator.

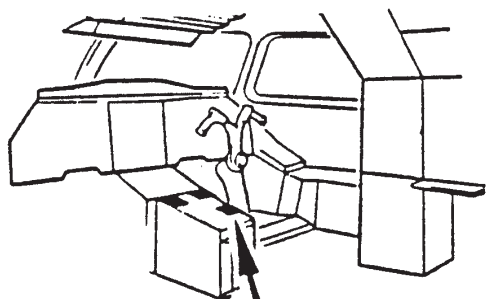
DSR TK/STS

Desired track displayed in left data indicator; system status (alignment status, performance index, or malfunction codes) in right data indicator.

On pressing the HOLD switch the left data indicator will display computer programme designation.

TK/GS

Present track displayed in left data indicator; ground speed in right data indicator.
(If GS < 75kt, true heading is displayed instead of present track).

INERTIAL NAVIGATION SYSTEM CONTROL MODULE
(Sheet 4 of 4)

ACTION CODES

01 CODE - OFF

02 CODE - ATT

03 CODE - ATT if navigation data degrades

04 CODE - GROUND OPERATION ONLY

05 CODE - CHECK MAL CODE

MAL CODE 55 - RELOAD NAV AID DATA

06 CODE - CHECK MAL CODE

MAL CODE 41 OR 43 - RELOAD PRESENT POSITION

MAL CODE 49 - CHECK MANUAL UPDATE AND
FLUSH IF NECESSARYSTATUS DISPLAY
(R.H. Indicator)

1 2 3 4 5 6

1st digit - 0 = INS in ALIGN mode

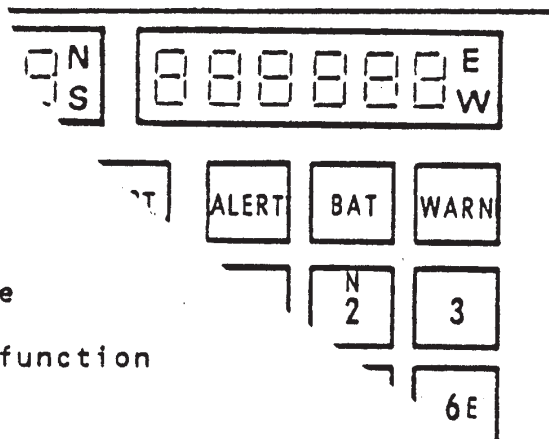
1 = INS in NAV mode

2nd & 3rd digits - Action or Malfunction
Codes

5th digit - Accuracy Index.

Sequences through A.I.
9-8-7-6-5 during align-
ment. 5 = alignment
achieved.If NAV mode is not sel-
ected, A.I. continues
sequencing through 4-3-2-
1-0 indicating quality
of alignment.When NAV mode is selected,
A.I. indicates quality of
indicated position data,
ranging from 1 through 9.
(1 = good, 9 = poor)

6th digit - Mode Index.

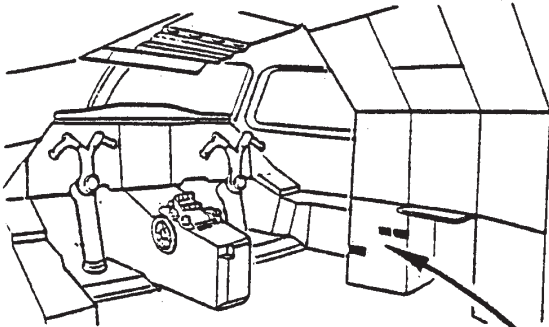
During alignment, indicates
mode index required for normal
alignment (always 5).In NAV mode, MI=5 indicates independent INS operation,
and MI=4 indicates aided operation.When '1' is keyed and inserted the unit goes into
position update eradicate mode then automatically
reverts to independent operation with MI=5 displayed.

15.03.06
24 MAY 79

CONCORDE FLYING MANUAL
NAVIGATION

British airways

INERTIAL NAVIGATION SYSTEM MODE SELECTOR UNIT

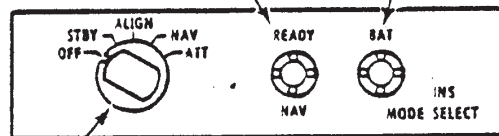


BAT LIGHT

On - only if while operating on battery power the INS automatically shuts down due to low battery unit voltage. The INS operates on battery for one 12 seconds period during coarse levelling. If the battery unit charge is below the required minimum level during this period, the INS shuts down and the BAT and WARN lights (red) are on.

READY/NAV LIGHT (Green)

On - with the mode switch in ALIGN, when the alignment status of the INS reaches 55. Remains lit until NAV is selected. Is on momentarily when alignment is accomplished with the mode selector in NAV.



MODE ROTARY SELECTOR

This rotary selector selects the modes of the INS. The knob must be pulled for rotation across mechanical stops between STBY and ALIGN and between NAV and ATT.

STBY - used only during ground operation; starts fast warm-up.

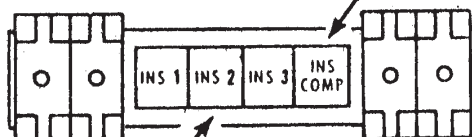
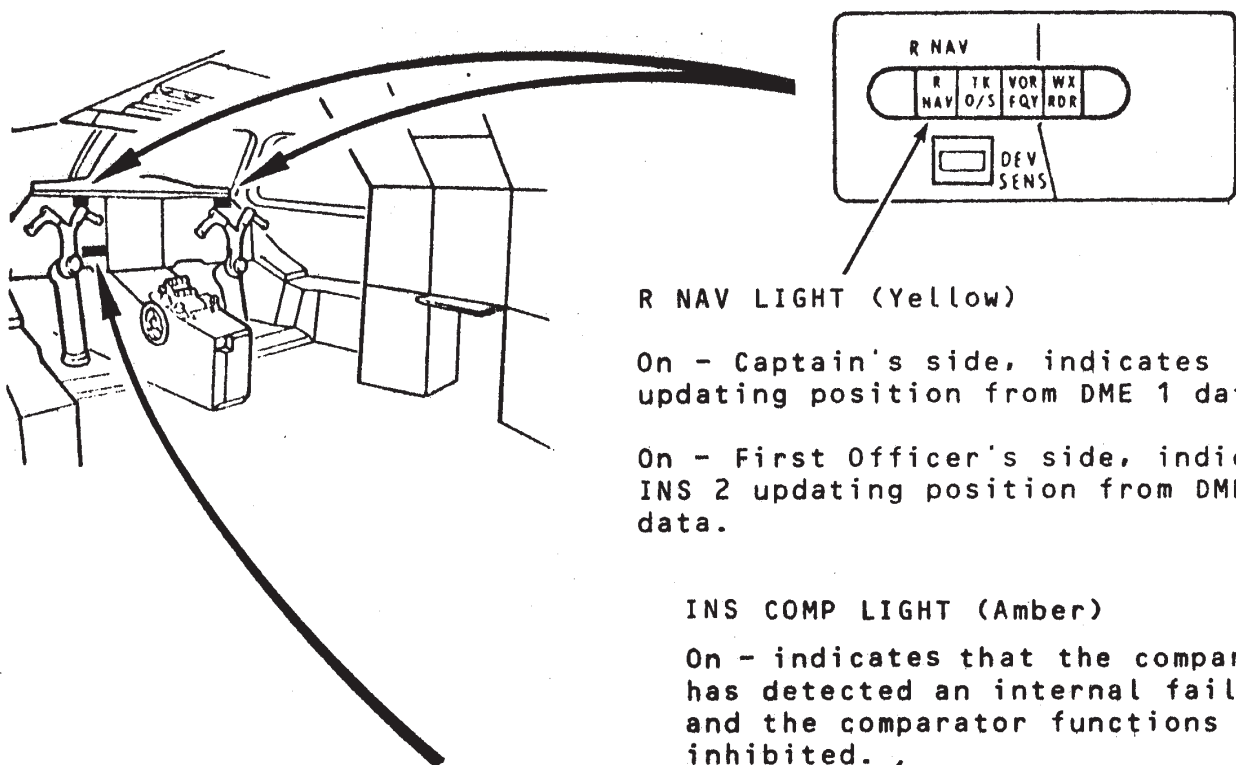
ALIGN - used only during ground operation while the airplane is parked. Starts gyro operation and automatic INS alignment provided the unit is warmed up.

Fine alignment does not start until present position is inserted at the control module.

NAV - used for normal operation after automatic alignment is complete. Must be selected before moving the airplane. The INS automatically sequences through the standby and alignment modes of operation when the NAV position is selected from any other position provided the airplane is parked and present position is inserted. Going directly from OFF to NAV eliminates the automatic shutdown feature in the event of an overheat. The automatic battery check is also eliminated.

ATT - used to provide only INS attitude signals. Shuts down the computer so that navigation and steering signals are not provided. Can be selected from any other position. Once selected, INS alignment is lost and it must be re-aligned on the ground before the navigation mode can again be used.

INS 1, INS 2, INS 3, & INS COMP LIGHTS



INS 1 - INS 2 - INS 3 LIGHTS (Red)

On - indicates internal auto detected failure or a failure detected by the comparator.

Comparator detected warning is caused by an error in one of the following:-

Pitch or roll attitude during cruise (above 600 ft).

Pitch or roll attitude, vertical acceleration or compass coupler 1 and 2 magnetic heading and INS 3 platform heading during approach (below 600 ft).

Threshold for attitude comparison is tighter during approach than in cruise.

Accompanied by the master warning system INS light (red) and audio (gong).

If the failure is detected by the comparator only (e.g. for INS 2):-

AP2 is disengaged

AT2 is disengaged (cruise threshold) if altitude is less than 600 ft.

If the failure is detected by the comparator and INS 2, then AP2 and AT2 may be disengaged depending on the AFCS mode engaged. When only two INSS are operating, a failure detected by the comparator causes the INS lights for both these INSS to come on.

RADIO NAVIGATION

DME MODE SELECTOR

S/B - DME interrogator is warmed up for 45 secs and not operative.

DME - normal position. Distance information is available up to 200 n.miles.

OVRD (Override) - distance information is available up to 399 n.miles.

SELECTED FREQUENCY WINDOW (VOR OR ILS)

TEST ROTARY SELECTOR

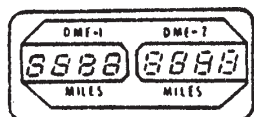
VOR UP/L - an internal test system simulates an up deviation of glide and a left deviation of localiser, provided ILS frequency is selected.

DME DN/R - an internal test system simulates a down deviation of glide and a right deviation of localiser provided ILS frequency is selected.

The TEST function is inhibited when the AP/FD is selected in VOR/LOC, GLIDE or LAND modes.

SETTING FREQUENCY ROTARY SELECTOR (Units and Tens of MHz)

SETTING FREQUENCY ROTARY SELECTOR (Fractions of MHz by 0.05 MHz increments)



DME INDICATOR

No. 2 VOR
POINTER

No. 1 VOR
POINTER

FAILURE FLAGS (Red/Black striped)

Top - loss of electric supply to RMI or heading servo failure or magnetic heading reference system failure.

Windows - VOR failure or Station out of range.

VOR RADIO MAGNETIC INDICATOR

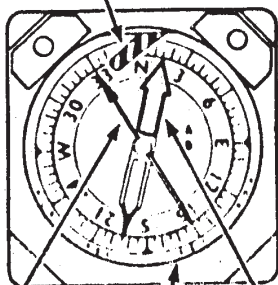
COMPASS CARD

Captain's - fed from No. 2 compass coupler providing the instrument transfer COMP switch is in its normal operating position.
First Officer's - fed from No. 1 compass coupler providing the instrument transfer COMP switch is in its normal operating position.

AUTOMATIC DIRECTION FINDER

FAILURE FLAG
(Red/Black striped)

Indicates: Loss of electric supply to RMI or heading servo failure or magnetic heading reference system failure.



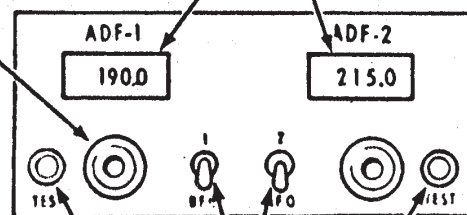
No.1 ADF
POINTER

No.2 ADF
POINTER

COMPASS CARD

Captain's compass card is normally supplied from No.1 compass coupler. First Officer's compass card is normally supplied from No.2 compass coupler.

**FREQUENCY
SELECTOR (2)**

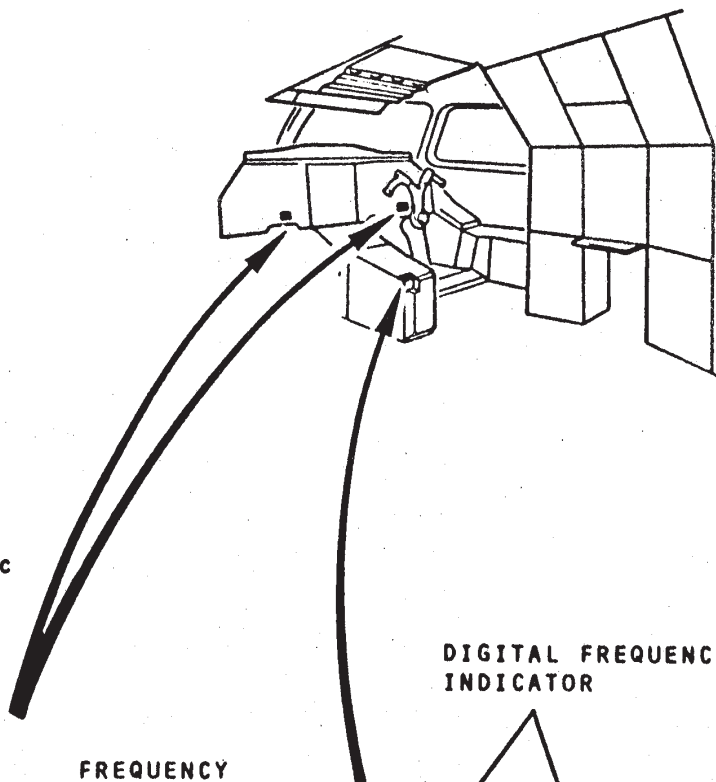


**DIGITAL FREQUENCY
INDICATOR**

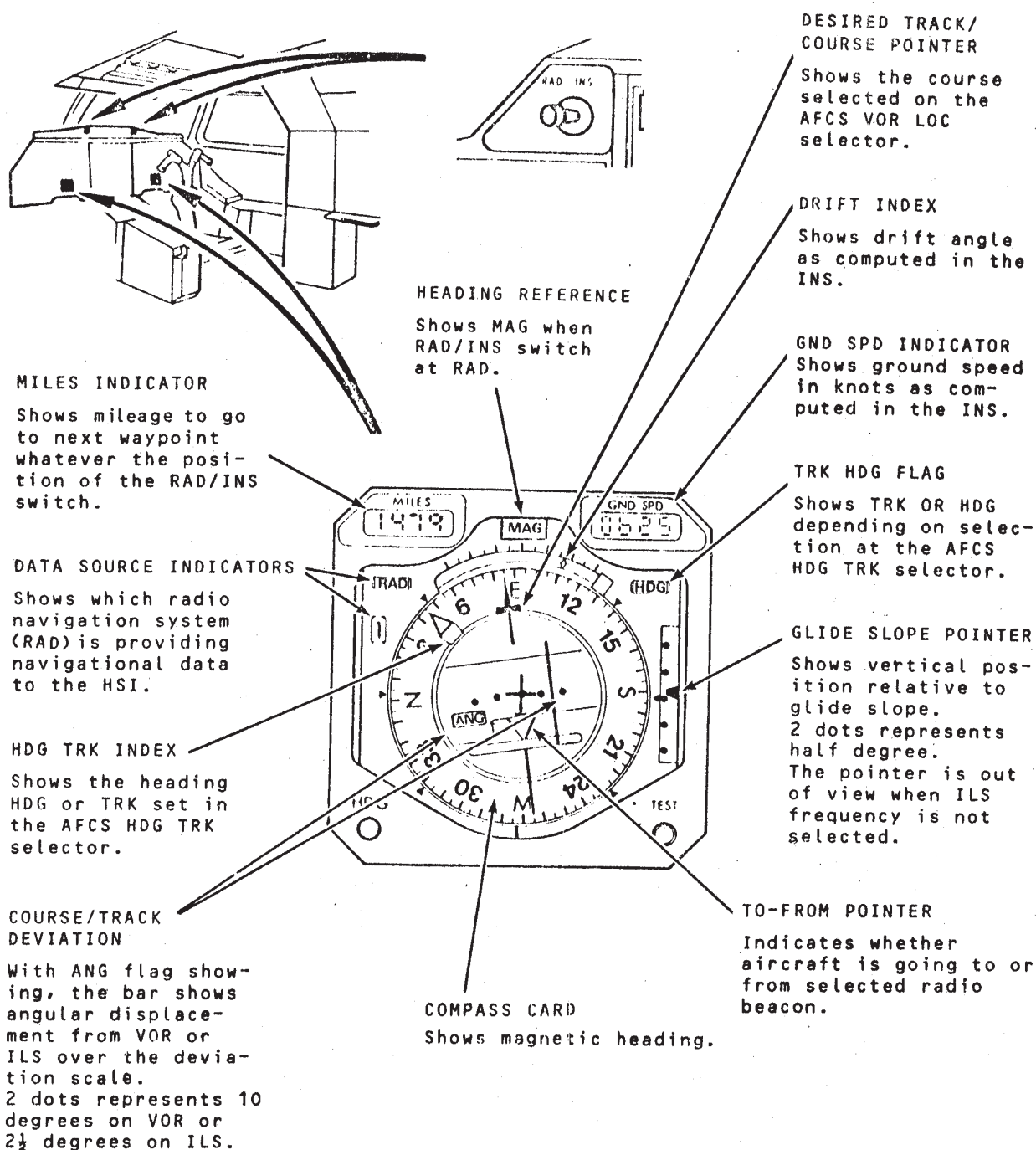
BFO SWITCH

TEST PUSH BUTTON

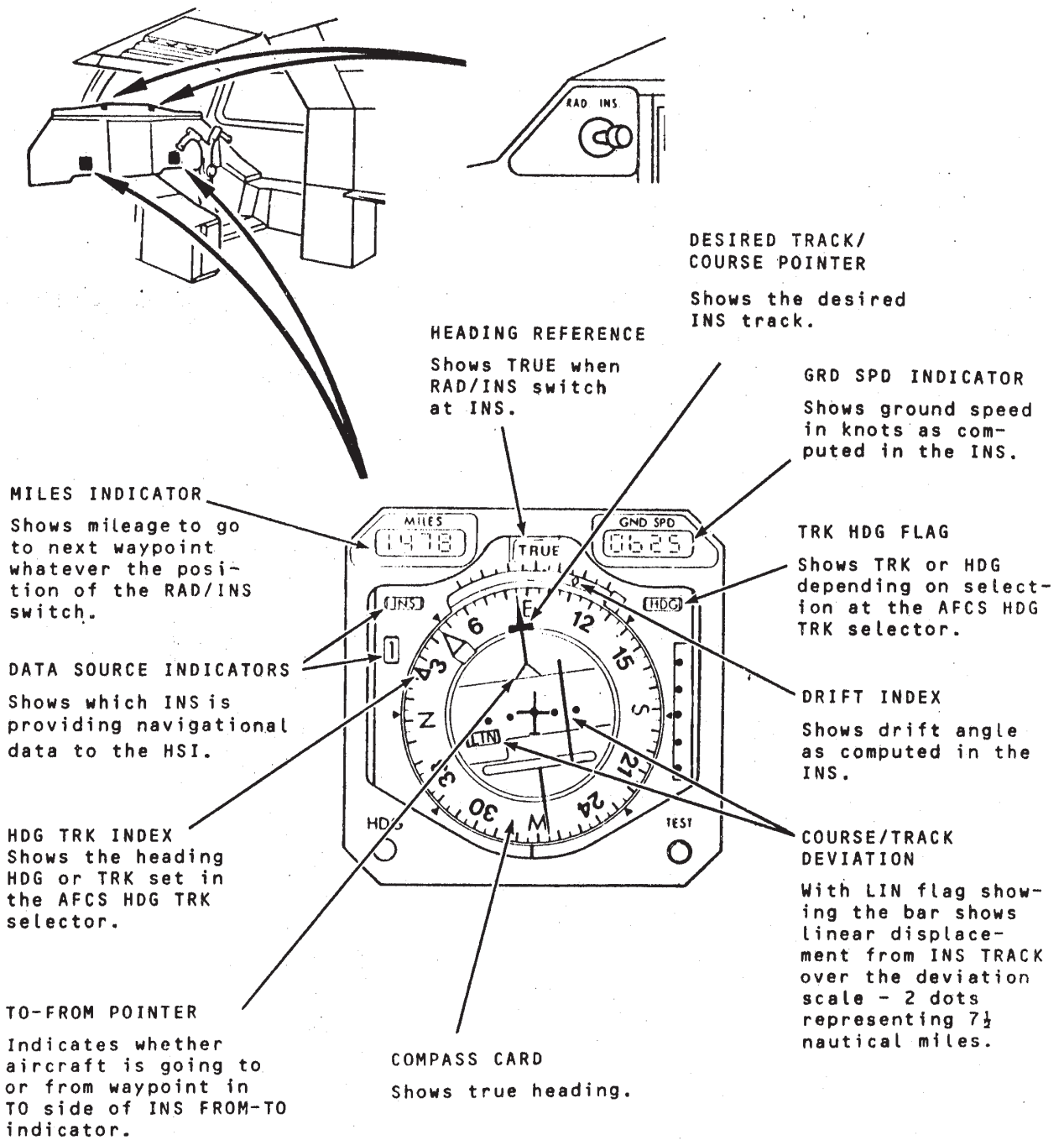
Pressed - tests the ADF receiver and operation of the ADF pointers.



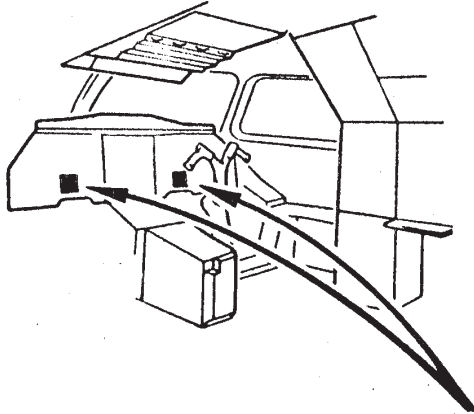
HORIZONTAL SITUATION INDICATOR (MAG)



HORIZONTAL SITUATION INDICATOR (TRUE)



HORIZONTAL SITUATION INDICATOR FAILURES AND WARNINGS



DATA SOURCE INDICATOR

May indicate 3 under certain failure conditions.

NAVIGATION FLAG

(5 White dots on a red background)

White dots - indicates loss of selected navigational system.

HEADING FLAG

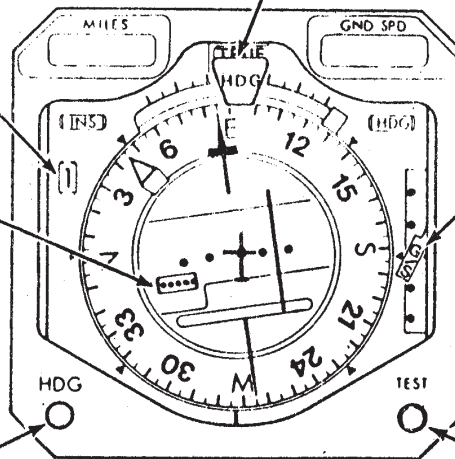
(Black HDG on a red background)

HDG - indicates that the selected heading reference is not valid.

GLIDE SLOPE FLAG

(Black G/S on a red background)

G/S - indicates that the glide slope signal is not valid.



HDG LIGHT (Amber)

On - indicates, when both RAD/INS switches are at the same selection, a discrepancy between the two HSIs.

TEST PUSH BUTTON

Pressed - tests the digital readouts of MILES and GND SPD displays (all 8's) and turns the compass card thus testing the source and discrepancy warnings.

RADIO ALTIMETER AND GROUND PROXIMITY WARNING

PULL UP LIGHTS (2) (Red)

On flashing - indicates:

Excessive rate of descent near the ground
(active below 2500 ft) (Mode 1)

OR

Excessive closure rate with the ground
(Mode 2)

OR

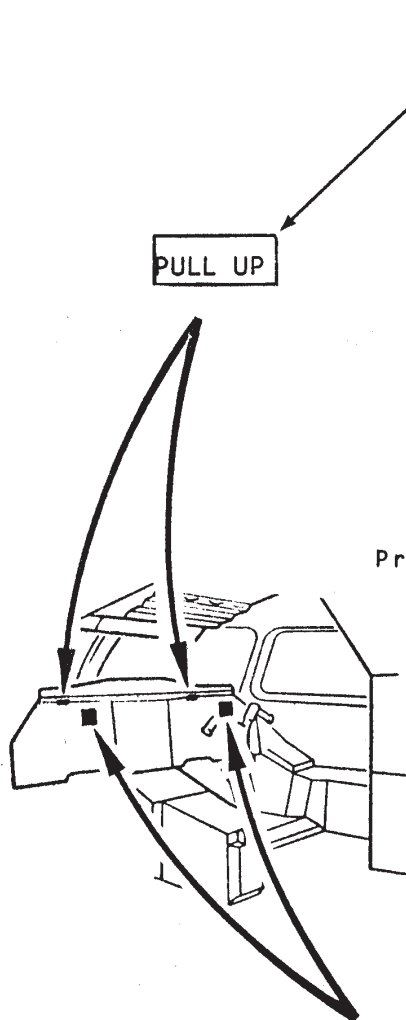
Loss of altitude when the aircraft is
below 700 ft after take-off or on go-
around (Mode 3)

OR

Landing gear retracted when aircraft
descends below 500 ft or droop nose not at
DOWN when aircraft descends below 200 ft
(Mode 4)Accompanied by a repeated audio (Whoop
Whoop Pull Up). The audio is repeated
until the aircraft is out of the hazar-
dous situation.

Pressed - tests the Ground Proximity warning system

OR

If the aircraft is below 1000 ft and
descending, inhibits the audio warning of
Mode 5 (Mode 5 is an audio (glide slope)
only with no visual warning) or if the
Mode 5 warning has already been triggered
will cancel it, if it is a "soft" warning.

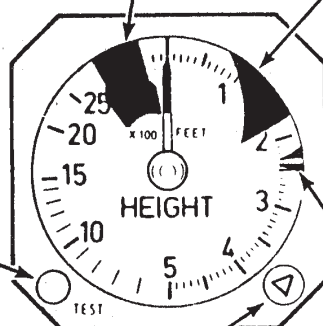
PULL UP

POINTER MASK
(Black)

FAILURE FLAG (Red)

Indicates:
- loss of instrument
power supply.
- radio altimeter
transceiver failure
- slaving error.

TEST PUSH BUTTON

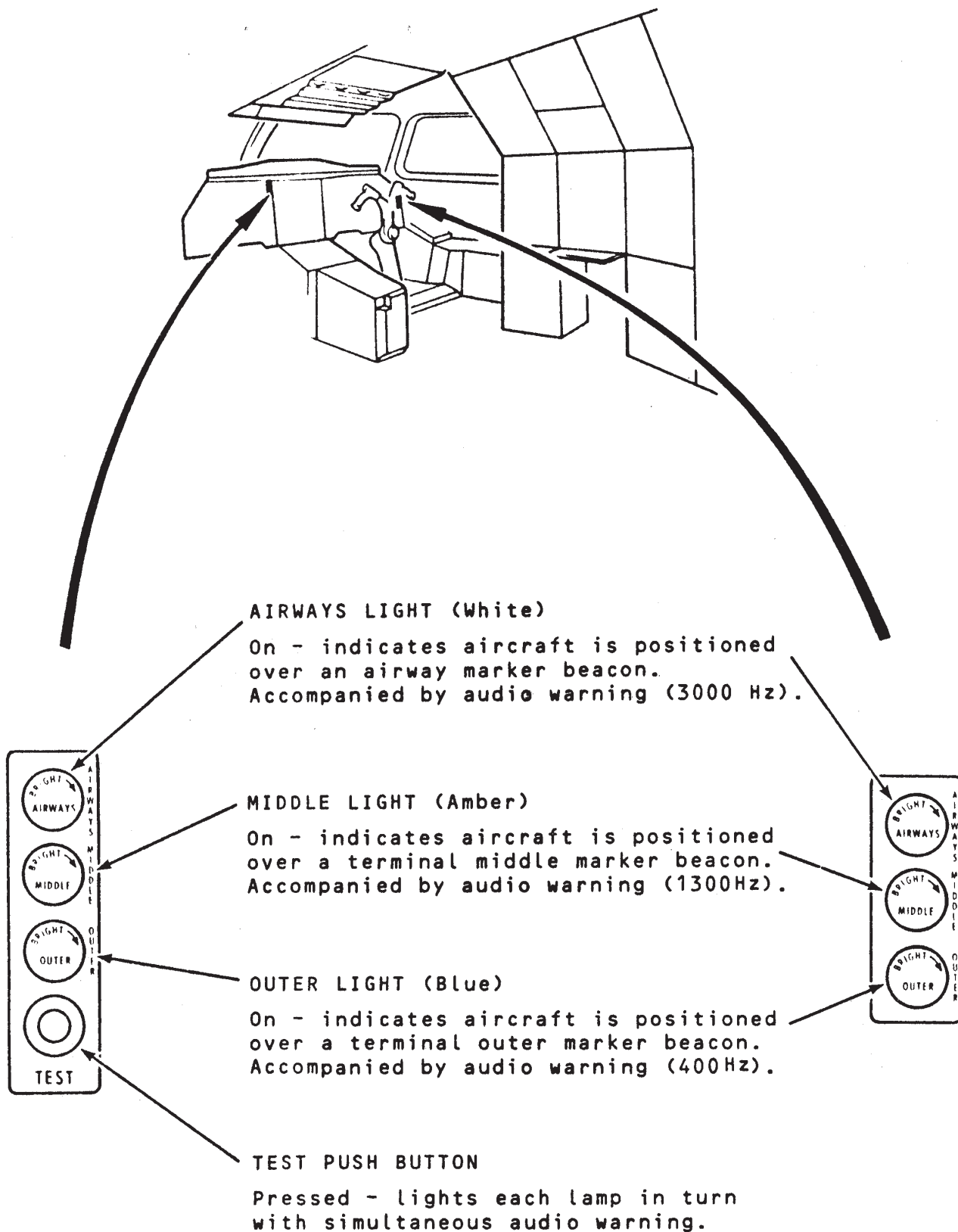
Pressed - tests the
radio altimeter and
its connection to
the ADIs.DH (Decision Height)
SETTING KNOBThe DH setting knob sets the
index to the decision height
Pressed - cancels the DH
warnings on both ADIs and
Warning and Landing Displays.

INDEX (Amber)

Shows the selected decision
height.

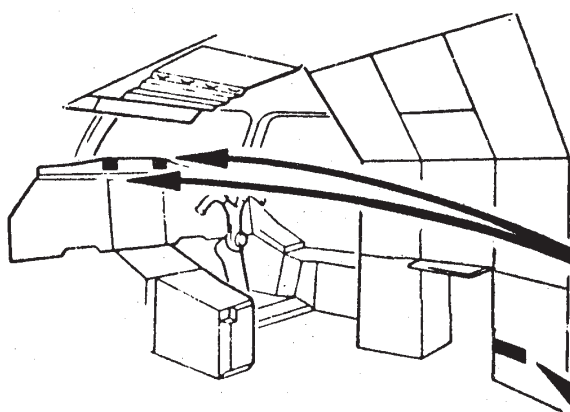
15.03.14
30 JUL.79

MARKER BEACON SYSTEM



(Unchanged)

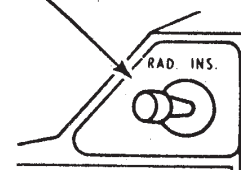
COMPASS CONTROL



CAPTAIN'S and FIRST OFFICER'S RAD/INS SWITCH

RAD - the associated HSIs display radio navigation data referenced to the magnetic heading.

INS - the associated HSIs display inertial navigation data referenced to true heading.



DUAL COMPASS CONTROLLER

Provides operational control and information display for two magnetic heading reference systems.

SYNCHRONIZATION ANNUNCIATOR (2)

Indicates the magnitude of system error in MAG mode by the amount of deflection.

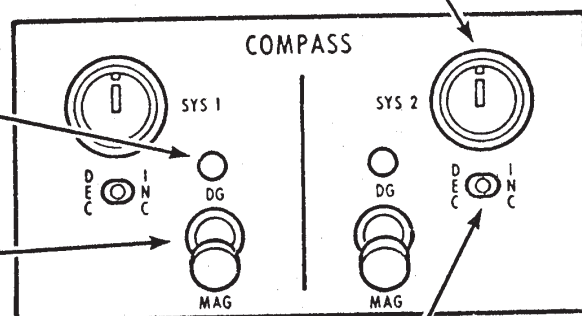
SLAVING CUT-OUT INDICATOR LIGHT (Yellow) (2)

On - during slaving cut-out or when in DG mode.

DG MAG SWITCH (2)

DG - the system follows the gyro heading supplied by the inertial navigation system. The slaving cut-out indicator will light and the synchronization annunciator is inhibited.

MAG - the system provides gyro-stabilized magnetic heading outputs. When the annunciator needle is centred the system is synchronized. The slaving cut-out indicator is off when the system is operating in MAG mode.



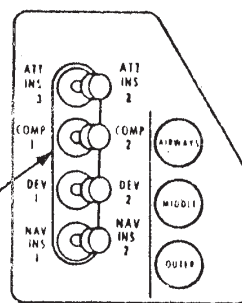
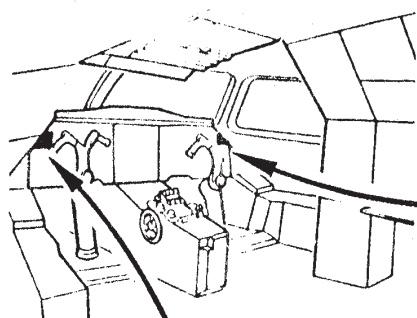
DEC INC SELECTOR (2)

Permits setting of an arbitrary heading. The selector is spring loaded to the centre and has two positions, DEC to the left and INC to the right to control the desired rotation.

DEC - the system drives down-scale, and decreases the heading.

INC - the system drives up-scale, and increases the heading.

INSTRUMENT TRANSFER SWITCHES



INSTRUMENT TRANSFER SWITCHES - FIRST OFFICER

- ATT INS 2 - INS 2 supplies attitude signals to the First Officer's ADI, roll, platform heading, digital data (ground speed, latitude, longitude, and along track acceleration) to compass coupler 2.
- ATT INS 3 - INS 3 supplies attitude signals to the First Officer's ADI, roll, platform heading, digital data (ground speed, latitude, longitude and along track acceleration) to compass coupler 2.
- COMP 2 - magnetic heading information source to the First Officer's HSI and ADF/RMI and the Captain's VOR/RMI is compass coupler 2.
- COMP 1 - compass coupler 1 supplies magnetic heading to First Officer's HSI and ADF/RMI, and Captain's VOR/RMI.
- DEV 2 - the First Officer's HSI is supplied from No.2 VOR and ILS receivers.
- DEV 1 - the First Officer's HSI is supplied from No.1 VOR and ILS receivers.
- NAV INS 2 - INS 2 supplies First Officer's HSI with navigational and heading data
- NAV INS 1 - INS 1 supplies First Officer's HSI with navigational and heading data

The normal position for the First Officer's instrument transfer switches is to the right.

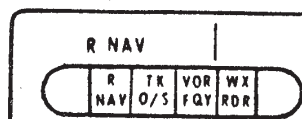
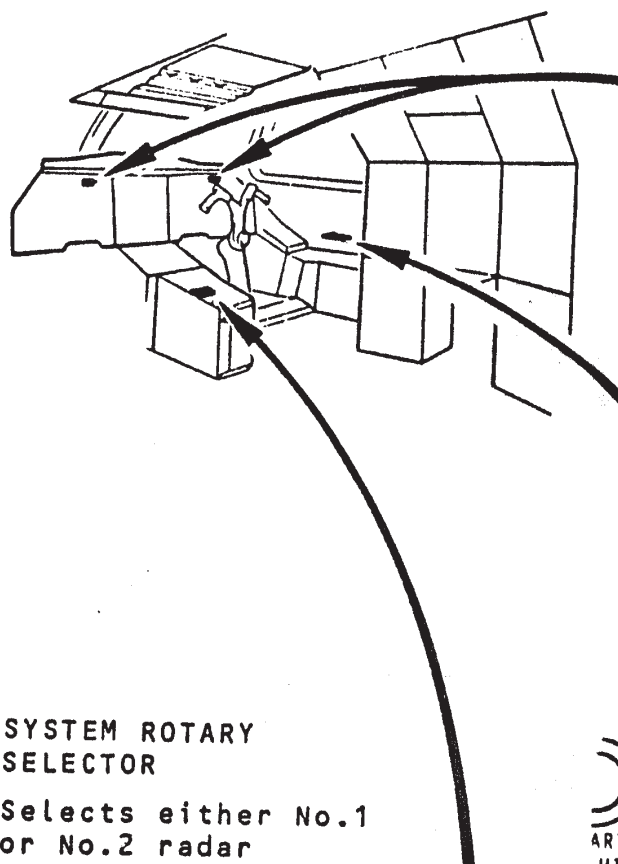
INSTRUMENT TRANSFER SWITCHES - CAPTAIN

- ATT INS 1 - INS 1 supplies attitude signals to the Captain's ADI, roll, platform heading, digital data (ground speed, latitude, longitude and along track acceleration) to compass coupler 1.
- ATT INS 3 - INS 3 supplies attitude signals to the Captain's ADI, roll, platform heading, digital data (ground speed, latitude, longitude and along track acceleration) to compass coupler 1.
- COMP 1 - magnetic heading information source to the Captain's HSI and ADF/RMI and the First Officer's VOR/RMI is compass coupler 1.
- COMP 2 - compass coupler 2 supplies magnetic heading to Captain's HSI and ADF/RMI, and First Officer's VOR/RMI.
- DEV 1 - the Captain's HSI is supplied from No.1 VOR and ILS receivers.
- DEV 2 - the Captain's HSI is supplied from No.2 VOR and ILS receivers.
- NAV INS 1 - INS 1 supplies Captain's HSI with navigational and heading data.
- NAV INS 2 - INS 2 supplies Captain's HSI with navigational and heading data.

The normal position for the Captain's instrument transfer switches is to the left.

Captain's and First Officer's COMP NAV-INS and DEV transfer switches have an electrical interlock between them to avoid cross feeding.

WEATHER RADAR CONTROL UNIT (Sheet 1 of 2)

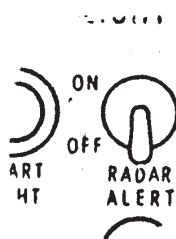


WEATHER RADAR LIGHT (Yellow)

On - flashing indicates receipt of a high strength return within plus or minus 10 degrees of aircraft heading and in the range 100-200 nm.

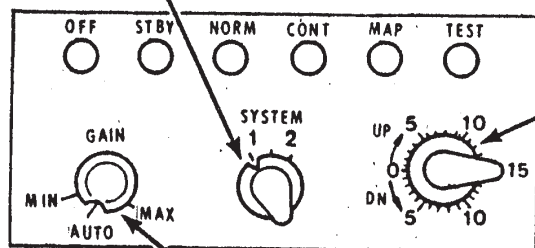
RADAR ALERT SWITCH

ON - radar warning light circuit is armed.



SYSTEM ROTARY SELECTOR

Selects either No.1 or No.2 radar transceiver.



TILT ROTARY SELECTOR

Selects the elevation and depression of the scanner from the horizontal.
0 - the scanner is horizontal whatever the aircraft attitude and position of the droop nose.

GAIN CONTROL

AUTO - automatically controls the receiver sensitivity to signals of varying intensity.

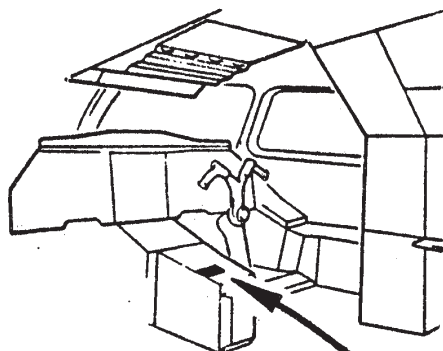
Used in conjunction with the function push button lights,
At NORM and CONT the adjustment is fixed at an average value.
At TEST the adjustment is inoperative but the gain is normal.

15.03.18
1 DEC.76

CONCORDE FLYING MANUAL
NAVIGATION

British airways
OVERSEAS DIVISION

WEATHER RADAR CONTROL UNIT (Sheet 2 of 2)



NORM PUSH BUTTON LIGHT (Green)

Press - the beam remains conical for maximum range coverage. Corresponds to a normal meteorological detection.

CONT PUSH BUTTON LIGHT (Green)

Press - selects contour. The circuit is the same as for NORM but an additional circuit is brought into operation. This contour circuit causes a black level instead of white peaks.

STBY PUSH BUTTON LIGHT (White)

Press - the radar transceiver selected is energized but no transmission occurs. After selection of STBY a 3 minute warm-up period should be allowed before an operating function is engaged.

OFF PUSH BUTTON LIGHT (White)

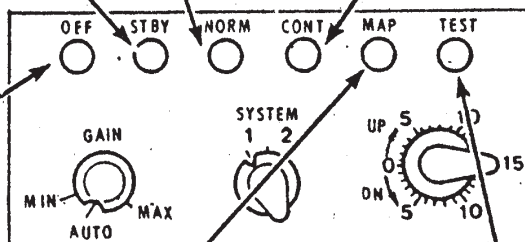
On - as soon as the aircraft busbars are supplied.

MAP PUSH BUTTON LIGHT (Green)

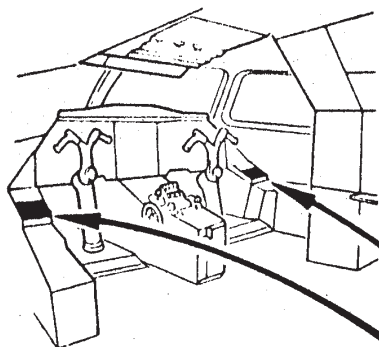
Press - the antenna radiates a beam of radio frequency (RF) energy, which with a downward tilt appropriate to the aircraft height, has a vertical dimension most suitable for terrain mapping at short to medium range.

TEST PUSH BUTTON LIGHT (Green)

Press - energizes the test circuitry of the radar system and ensures that the operating functions can be tested without transmission. The antenna sweeps during the test.



WEATHER RADAR SCREEN UNIT



RANGE ROTARY SELECTOR

Selects the scale projected on the screen. There are three possible selections, the numbers being the actual range in nautical miles 30, 100 and 300.

30 - one mark appears at 25NM.

100 - four marks appear; one every 25NM.

300 - six marks appear, one every 50NM.

Pictures on the screen are automatically erased when another range is selected.

ERASE PUSH
BUTTON.

POLAROID FILTER SLIDE

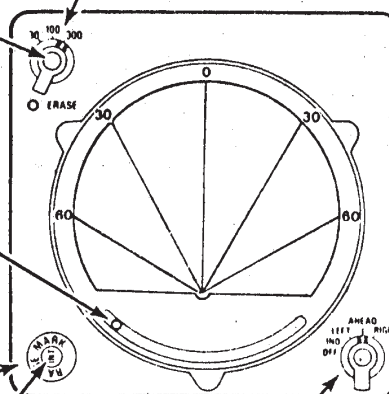
When fully to the left, picture is at maximum brightness (yellow/green). For night flying, the image is selected to dark red by moving the slide towards the right.

RANGE MARKS CONTROL

Adjusts the brightness of the marks.

INTENSITY (INT) CONTROL

Adjusts the sensitivity of the indicator. The echo (snow) disappears between 0 and 25 nautical miles and the brightness is adequate above 70 nautical miles.



RADAR SCREEN ROTARY SELECTOR

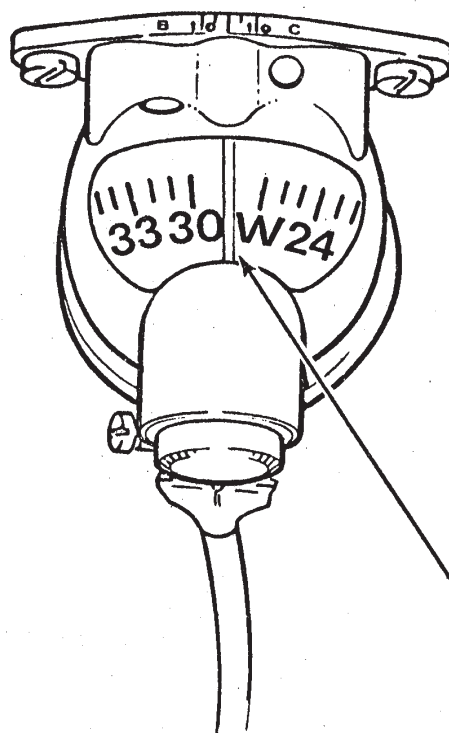
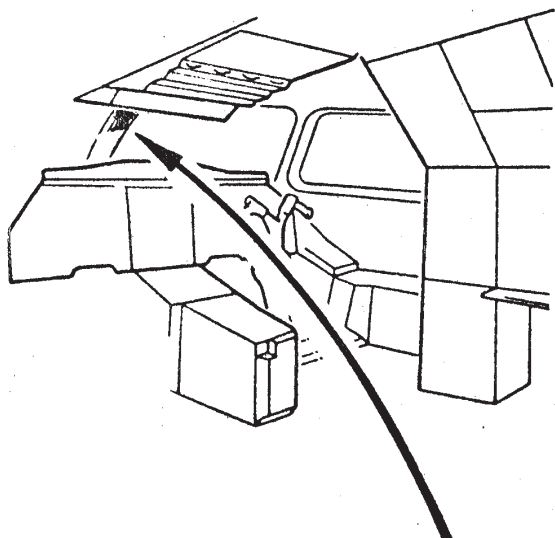
IND OFF - radar screen is de-energized but the transceiver is still operational.

LEFT - the sweep centre is displaced to the right. Distant clouds to the left of the heading and not visible on the AHEAD position will be shown.

AHEAD - the sweep centre is on the aircraft longitudinal axis and covers a sector of 170 degrees.

RIGHT - the sweep is displaced to the left.

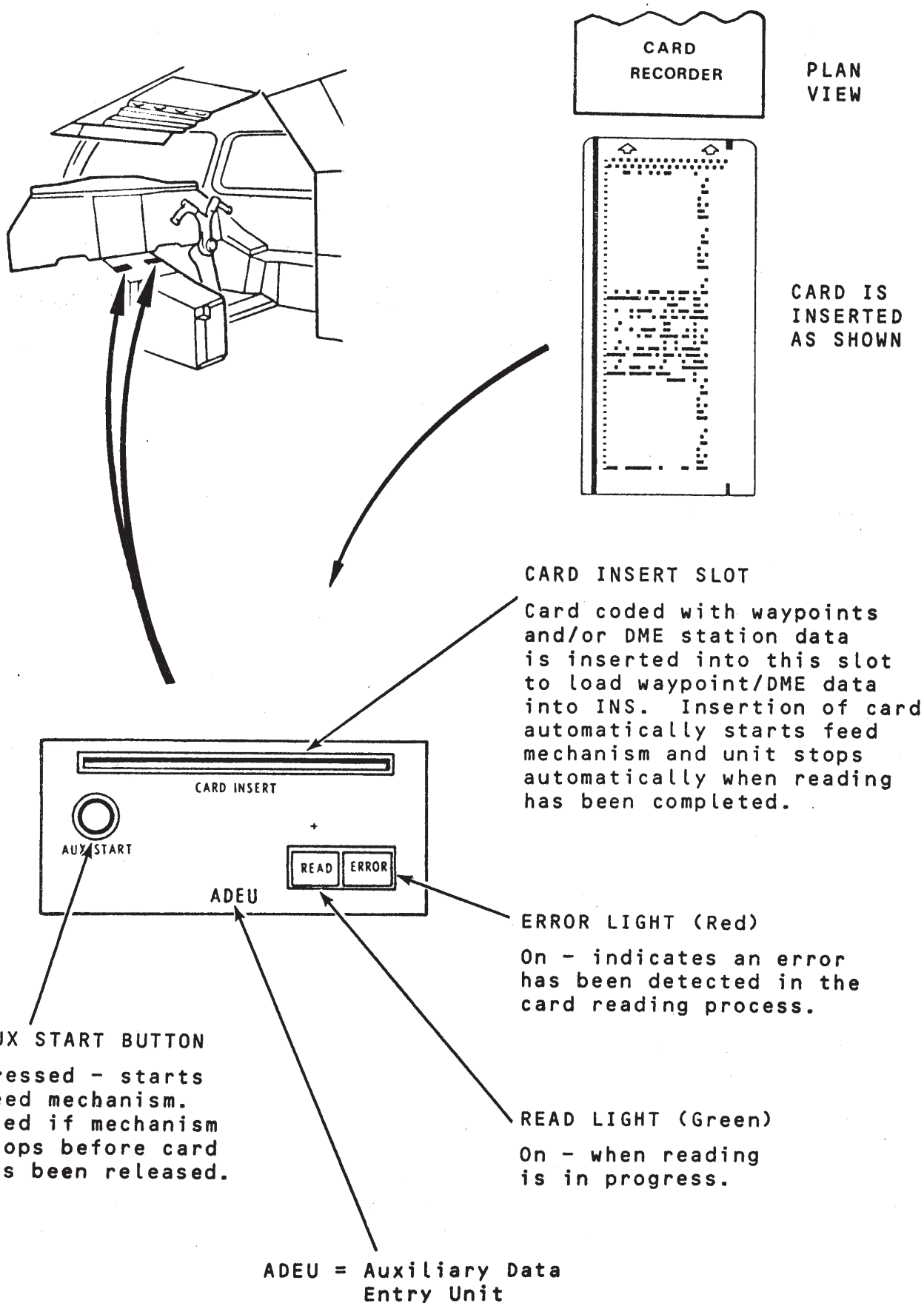
STANDBY COMPASS



STANDBY COMPASS

Magnetic heading is read from the compass card against the lubber line. A deviation card is located immediately above the standby compass. This indicates the error in the compass readings over the range of indication and the deviation must be added to or subtracted from the indicated heading as appropriate.

INS CARD READER UNIT



Chapter 16

NOSE AND VISOR

NOSE AND VISOR

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Description and Operation	16.01.01
Schematics	
Normal Operation Sequence Diagram (Green Hydraulics)	16.02.01
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Emergency Operation Sequence Diagram	16.02.03
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Normal Control	16.03.01
Indication	16.03.02
Standby Control	16.03.03
Emergency Control	16.03.04

NOSE AND VISOR

GENERAL

On take-off and landing the entire nose fairing forward of the windshield, including the visor, is drooped to improve visibility. When raised the nose and visor give the aircraft a clean aerodynamic shape. The visor, which also protects the windshield from the effects of kinetic heating, has large transparent panels which provide a good field of vision around the flight path.

DESCRIPTION

The visor has two positions: Up and down

- Up position is maintained by a mechanical uplock
- Down position is maintained by hydraulic pressure and mechanical springs.

The nose has three positions: Up, 5° , down ($12\frac{1}{2}^{\circ}$)

- Up position is maintained by two mechanical uplocks
- 5° down position is maintained by 2 jacks internal locks
- Down position is maintained by hydraulic pressure, aerodynamic loads and nose weight.

This gives 4 normal configurations:

1. Visor up, nose up
2. Visor down, nose up
3. Visor down, nose 5°
4. Visor down, nose down

The visor/nose configuration is easily recognizable from the flight deck.

OPERATION

There are three different operational modes:

Normal

Green hydraulic power supplies

- a single jack which operates the visor
- a pair of jacks working in parallel to operate the nose.

It also supplies power to release visor and nose uplocks.

Standby

The yellow system is available only for lowering the visor and nose. This standby system unlocks and lowers the visor through the normal jack but only releases the locks of the nose thus allowing its own weight and aerodynamic loads to lower it to the 5° or down ($12\frac{1}{2}^{\circ}$) positions.

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NOSE AND VISOR

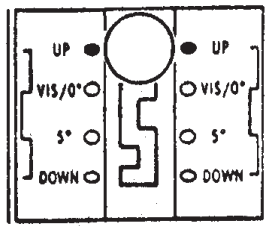
Emergency Operation

Should there be a complete failure of the green and yellow hydraulic systems the nose uplocks can be released mechanically thereby allowing the nose to fall freely to the 5° position. The downward movement of the nose automatically releases the visor uplock and the visor is then lowered by gravitational and aerodynamic loads assisted by spring action.

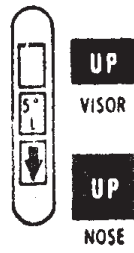
Controls and Indications

Each mode of operation has its own control.
The indication system is common to all modes of operation.

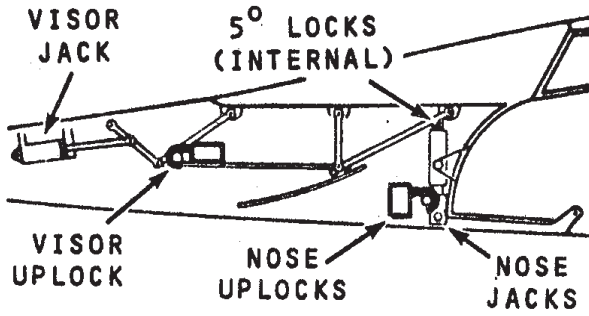
NORMAL OPERATION SEQUENCE DIAGRAM (GREEN HYDRAULICS)



VISOR/NOSE

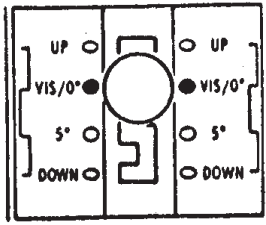


UP
VISOR
UP
NOSE



NOSE 0°
VISOR UP
SUPERSONIC
OR SUBSONIC
CRUISE

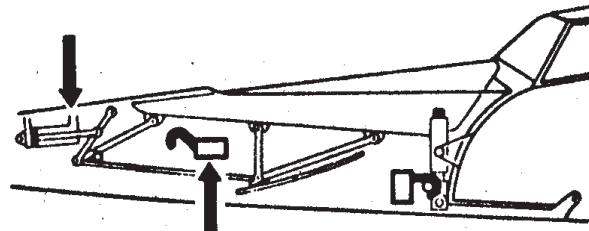
← VISOR IN TRANSIT
6-8 SECS



VISOR/NOSE

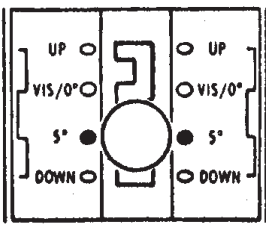


DOWN
VISOR
UP
NOSE

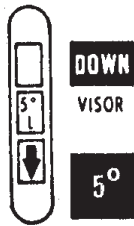


NOSE 0°
VISOR DOWN

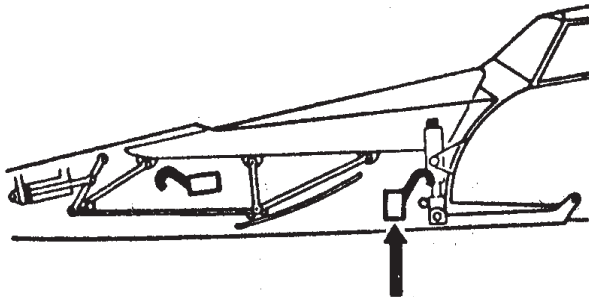
← NOSE IN TRANSIT (0°-5°)
4-6 SECS



VISOR/NOSE

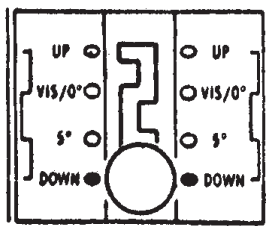


DOWN
VISOR
5°
NOSE

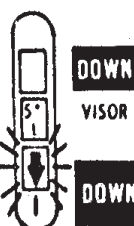


NOSE 5°
VISOR DOWN
TAKE OFF
AND
APPROACH

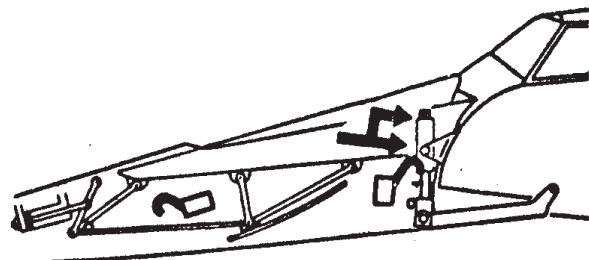
← NOSE IN TRANSIT (5°-12½°)
5-7 SECS



VISOR/NOSE

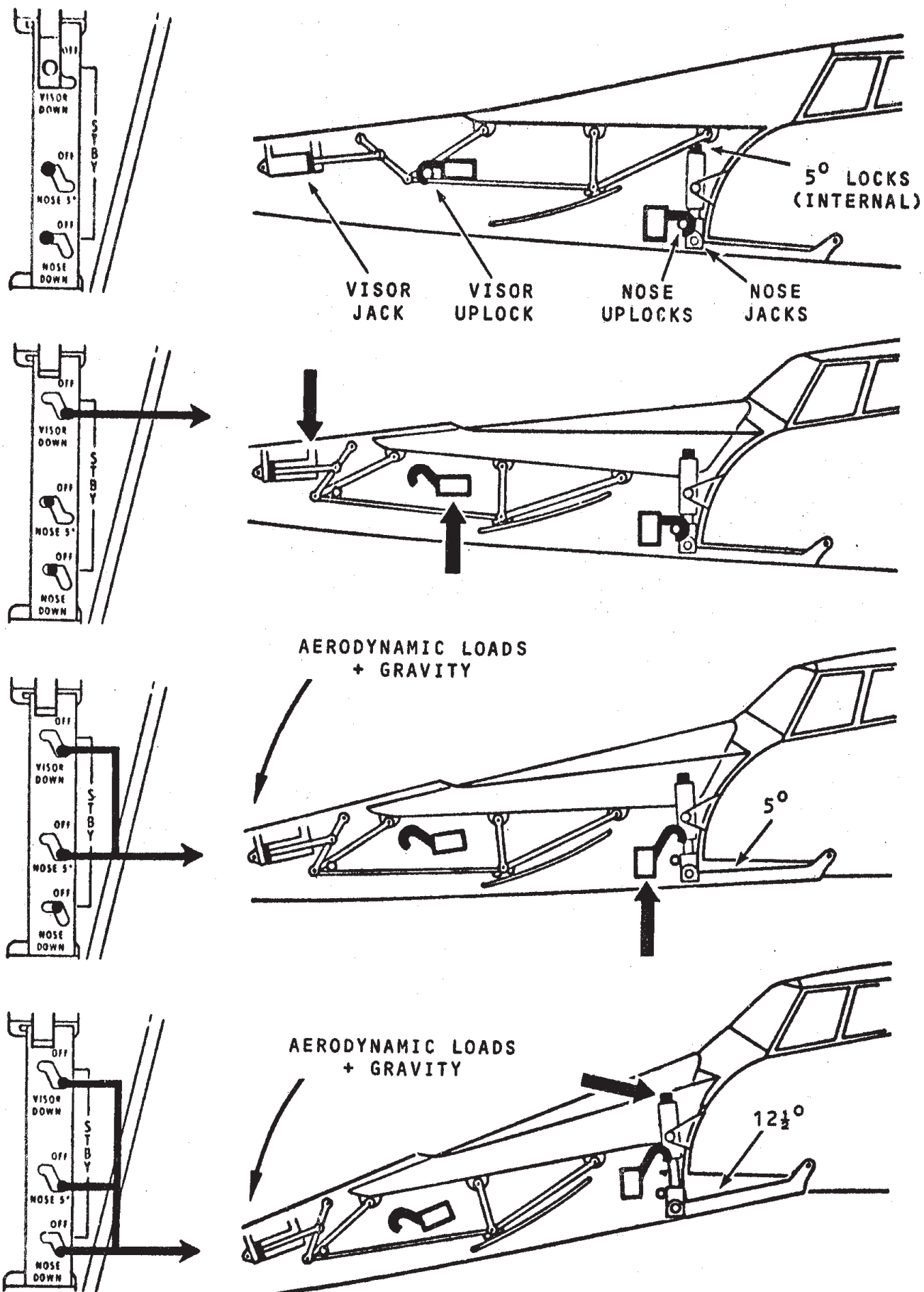


DOWN
VISOR
DOWN
NOSE

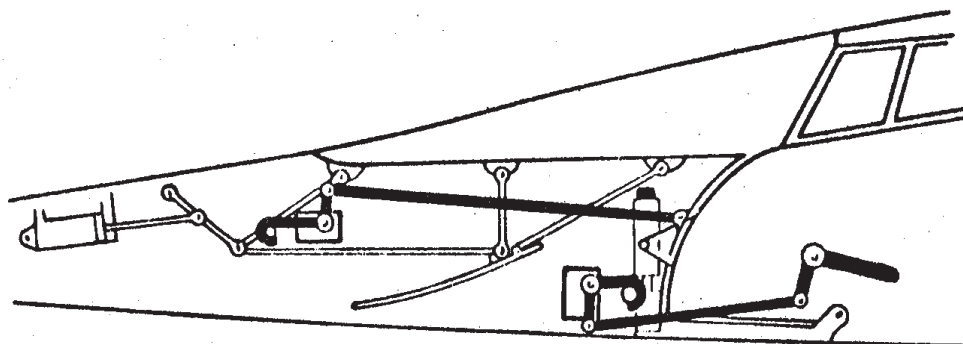


NOSE 12½°
VISOR DOWN
LANDING
AND
TAXIING

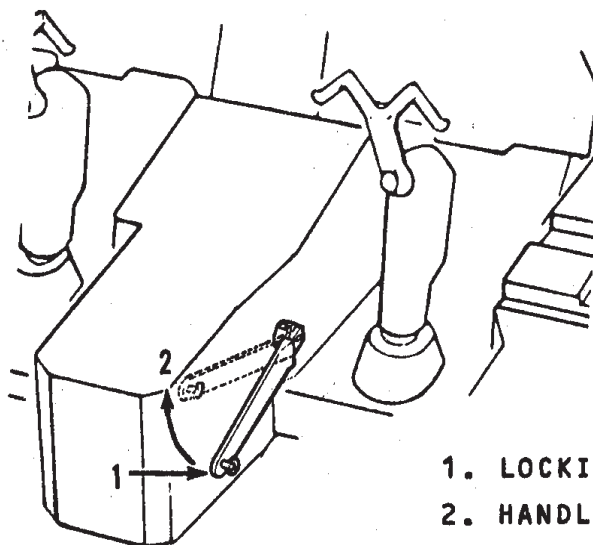
STANDBY OPERATION SEQUENCE DIAGRAM (YELLOW HYDRAULICS)



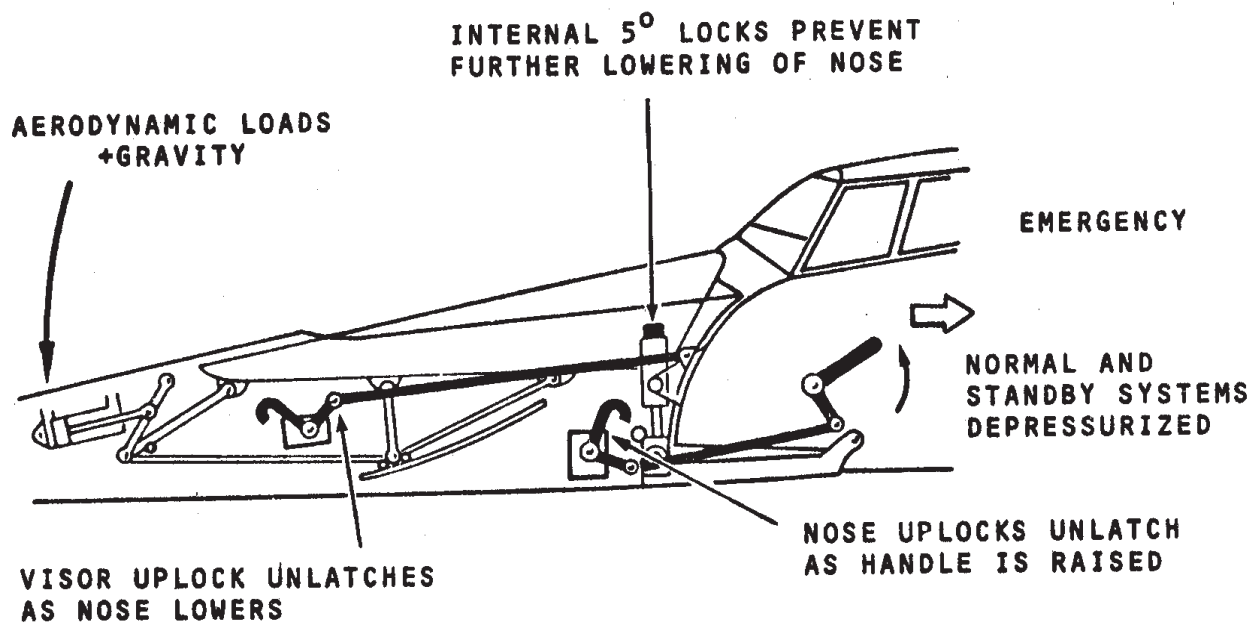
EMERGENCY OPERATION SEQUENCE DIAGRAM



NORMAL



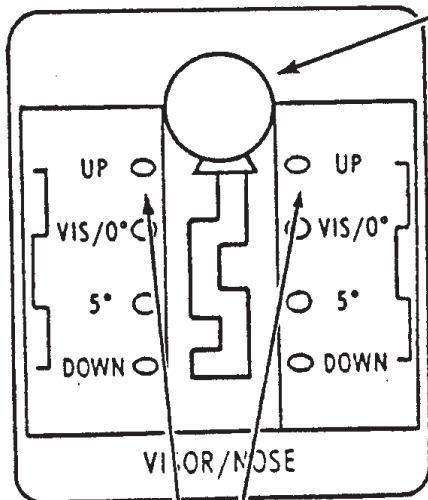
1. LOCKING PIN REMOVED
2. HANDLE PULLED



VISOR MOVES DOWN - UNDER AERODYNAMIC LOAD, SPRING ASSISTED.

NORMAL CONTROL

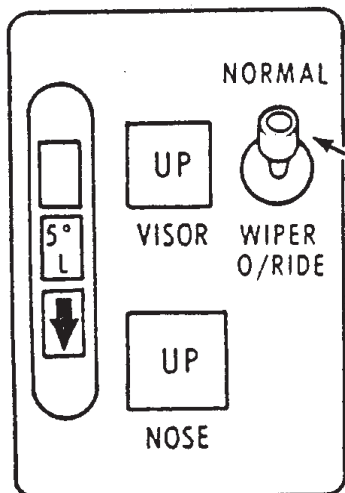
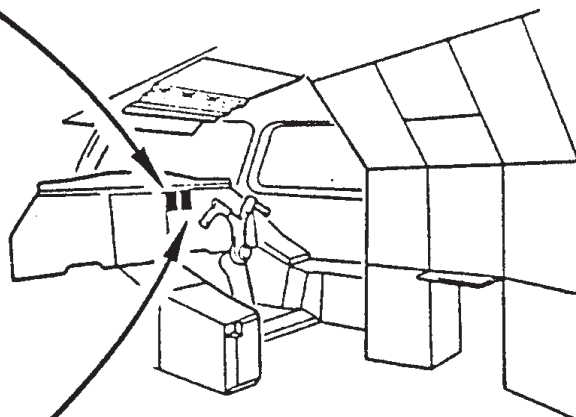
VISOR/NOSE CONTROL LEVER



The VISOR/NOSE lever is fitted with a collar beneath the knob, this collar must be raised before the lever is moved, thus preventing inadvertent operation. A baulk is fitted to prevent inadvertent selection of DOWN from UP or VIS/0°. At the 5° lever position the collar must be released and lifted again before DOWN can be selected.

LEVER POSITION LIGHTS (Green)

There are two lights at each lever position for each visor/nose selection. They are on to indicate only the position of the lever.



WIPER O/RIDE SWITCH

NORMAL - inhibits the visor raise operation if one of the windscreen wipers is not correctly parked

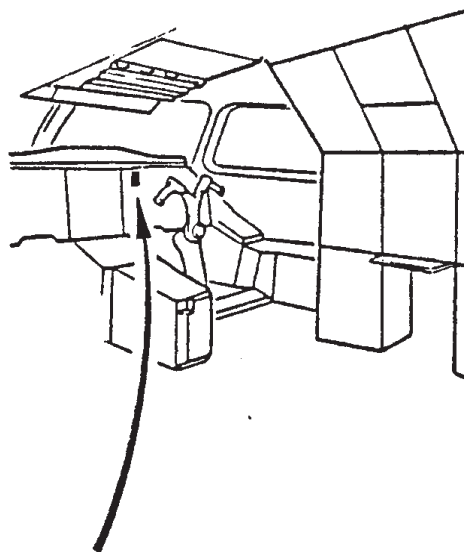
O/RIDE - if the visor raise sequence remains inhibited, with the windscreen wipers correctly parked, O/RIDE is used to bypass the inhibition.

(Unchanged)

INDICATION

OVERSPEED WARNING (Warble)

The overspeed warning (warble) sounds when the visor uplock is released at a speed greater than $M = 0.95$ or when the nose is below the 5° position at a speed greater than 270 kt.



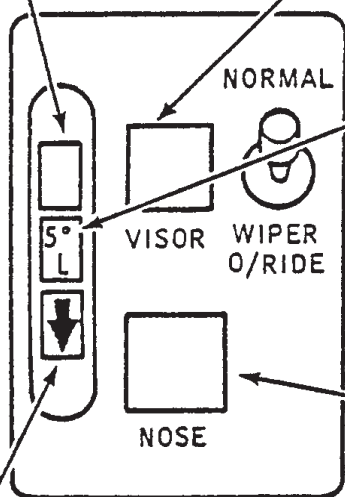
UNLOCK LIGHT (Red)

On - indicates that either the visor or nose is not at a specified position or is not positively locked.

The light may come on to indicate mechanical disconnect of nose position transmitter.

VISOR MAGNETIC INDICATOR

-  Visor fully raised.
-  Visor fully lowered.
-  Visor in transit.



5° L LIGHT (Amber)

On - indicates that one or both of the nose 5° locks is or are released.

NOTE:

The light goes off, though the 5° locks remain released, when the nose down position is reached.

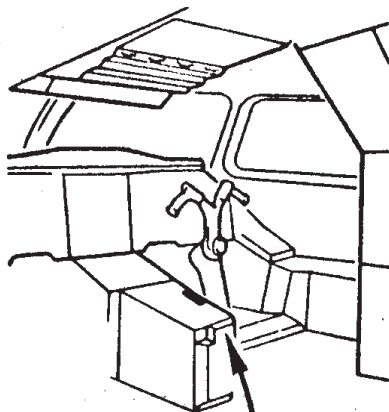
NOSE MAGNETIC INDICATOR

-  Nose fully raised
-  Nose 5° down
-  Nose fully lowered
-  Nose in transit

DOWN LIGHT (Green)

On - indicates that the nose and visor are both fully down.

STANDBY CONTROL

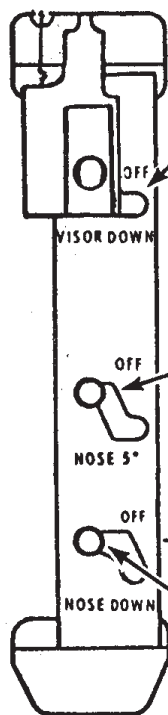


NOSE/VISOR STBY CONTROL

The nose/visor STBY control comprises 3 switches guarded by a lock and slotted plate that ensures correct sequencing of the system.

STBY CONTROL SWITCH TO VISOR DOWN

Setting the STBY control switch to VISOR DOWN unloads the yellow hydraulic system and selects it to release the visor uplock and drive the visor down.



STBY CONTROL SWITCH TO NOSE 5°

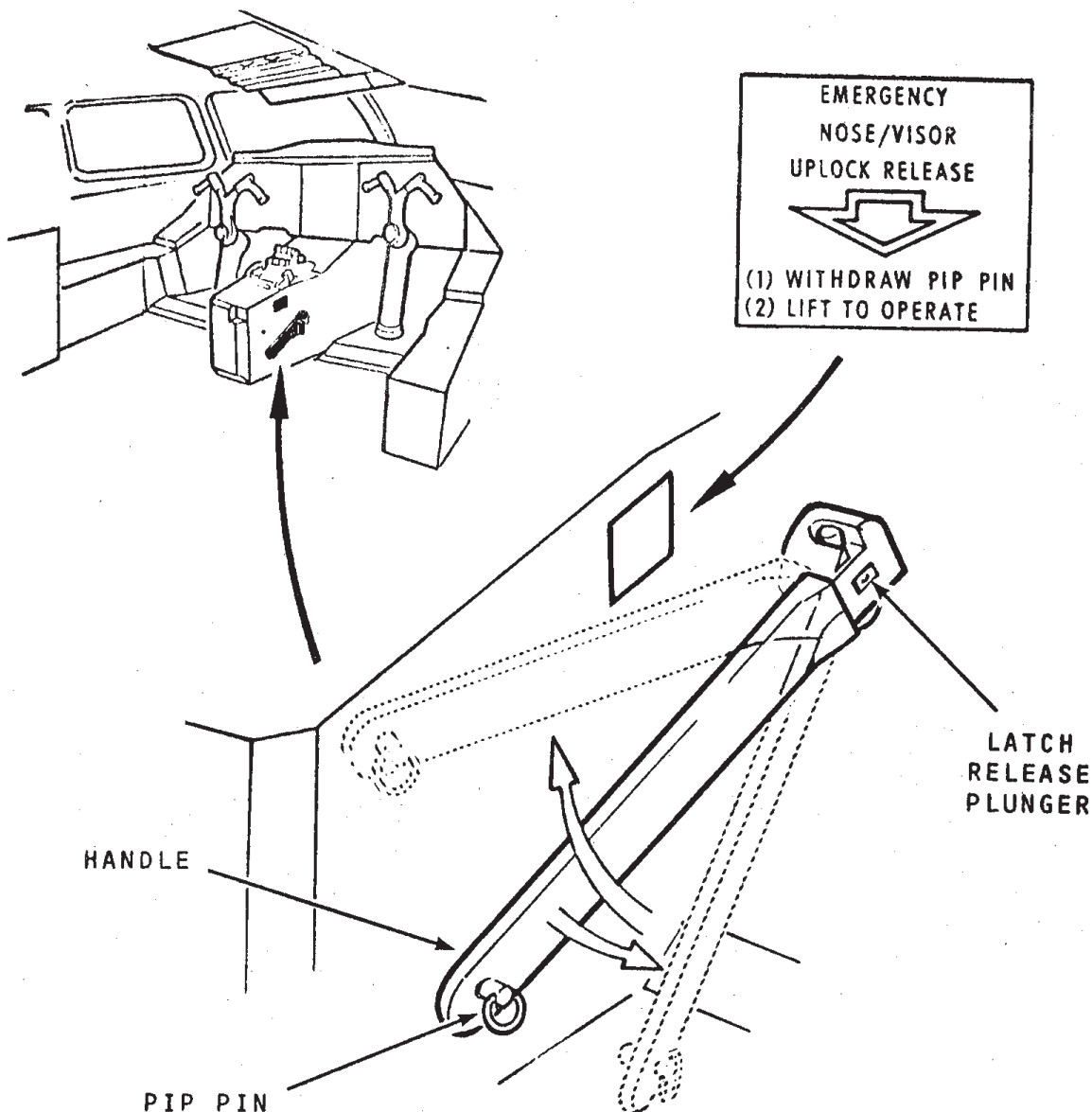
Setting the STBY control switch to NOSE 5°, selects the yellow hydraulic system to release the nose uplocks, thus allowing the nose to fall to the 5° position under its own weight and aerodynamic loads.

If the visor is up as the nose falls the visor uplock is released by a mechanical linkage and the visor is then lowered by yellow hydraulic pressure.

STBY CONTROL SWITCH TO NOSE DOWN

Setting the STBY control switch to NOSE DOWN selects the yellow hydraulic system to release the 5° locks (2) allowing the nose to fall to the down position.

EMERGENCY CONTROL



EMERGENCY NOSE/VISOR UPLOCK RELEASE HANDLE

Pulling the handle out and upwards, releases the nose uplocks (2) through a mechanical linkage thus allowing the nose to fall to the 5° position under its own weight and aerodynamic loads.

The handle is self locking in the raised position. With the handle raised, the normal and standby systems are inhibited, therefore there are no means of lowering the nose below 5°.

If the visor is in the up position as the nose falls the visor uplock is released by a mechanical linkage allowing the visor to fall to the down position assisted by aerodynamic loads and the mechanical spring pots.

Chapter 17
PNEUMATICS

Chapter 18
POWER PLANT

POWER PLANT

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GENERAL

The power plant comprises four identical propulsion units mounted in nacelles beneath the wings. Each nacelle contains two propulsion units separated by a centre wall forming a firewall, each propulsion unit comprising:-

- A variable-geometry engine air intake.
- A Rolls-Royce OLYMPUS 593 Mark 610 engine with reheat, aligned with the air intake. The engine is contained within an engine bay formed by the centre wall, access doors and, forward, a firewall separating the engine bay from the intake structure.
- A secondary nozzle structure which provides a mounting for the thrust reverser buckets forming the variable area secondary nozzle.

ENGINE AIR INTAKES

Each engine air intake is basically rectangular in cross section with a moveable ramp in the roof and spill door in the floor. Hydraulic actuators position the ramp to vary the intake capture area and open the spill door to augment the spill of unwanted air.

At take off and low speeds an auxiliary inlet vane, integral with the spill door, provides extra air to the engine. This vane is operated by differential pressure only. During operation of the spill door the vane is locked in the closed position.

A perforated bleed through the lower surface of the intake aids inlet performance at high Mach numbers. The flow through this bleed is limited by the exit cross section only and is not mechanically controlled.

OPERATION

At speeds below $M=1.3$ the ramps remain fully up and the spill doors closed. At speeds above $M=1.3$ the ramps and spill doors are positioned between scheduled maximum and minimum angular positions determined by the prevailing control parameters, namely intake pressure ratio, Mach number, engine speed N_1 , angle of attack and actual ramp and spill door positions. The change in ramp angle varies the intake capture area, controls the fore spillage of air and creates a shockwave system originating at the ramp angle. This shockwave system slows the air entering the intake to approximately $M=0.5$. In the optimum configuration at any Mach number the ramp is positioned to cause the shockwaves to converge on the lower lip of the floor.

When the predetermined scheduled ramp angle is reached any excess air entering the intakes (e.g. during very high ambient temperatures or during throttling) is dumped through the spill door. In addition, as the angle of the spill door increases the scheduled maximum ramp angle is increased by an incremental function of the spill door angle.

(Unchanged)

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The hydraulic actuators of the ramps and spill doors are supplied by the two main hydraulic systems. Intakes 1 and 2 are supplied by the green system and intakes 3 and 4 by the blue system. The standby supply for all intakes is the yellow system.

There are two identical control lanes per intake. A failure of the lane in control will cause an automatic changeover to the other lane. A method of manual control of the ramps and spill doors is provided.

When hydraulic pressure to an intake is low or when the intake is not being auto-controlled, ramp movement is prevented by auto-application of a brake. Spill door movement is prevented by hydraulic locking of its operating jack.

ENGINE BAY VENTILATION

Engine bay ventilation is provided by air from the engine air intakes passed to the engine bay by way of secondary air doors in the firewall between the intake structure and the engine bay.

The secondary air doors are opened to provide a cooling ventilating flow of air around the engine, and are automatically controlled to open when the aircraft speed exceeds $M = 0.26$ for engines No.1, 2 and 3 and 220 kt for engine No.4.

ENGINE FUEL FEED

Fuel under aircraft collector tank pump pressure is delivered to the engine first stage pump and on through a fuel filter and oil cooler to the second stage pump in the fuel control unit. The fuel then passes through the throttle valve, the HP shut-off valve, a flow meter and a dump valve to the burners. Reheat fuel is taken from the first stage pump outlet and delivered via a flow meter to the reheat spray ring.

ENGINE OIL SYSTEM

The engine lubrication system lubricates the five main bearings of the engine, accessory drives and gears. Scavenge pumps return the oil from the five main bearings and gearbox through a fuel-cooled oil cooler to the tank.

REHEAT SYSTEM

The reheat system operates by burning fuel within the jet pipe to increase the temperature of the turbine exhaust gases. This increases the velocity of the exhaust gases thereby producing additional thrust.

The reheat is normally used at take off and during the transonic acceleration.

ENGINE CONTROL

Two identical, electrical throttle control systems control each engine; a failure of the system in control will cause an auto-

END IN ENC

matic changeover to the other system.

The throttle control units control the engine, using the position of the throttle levers, the engine control schedules and the engine limiters.

The engine control schedule is the schedule of the relationship between the low pressure spool (N_1) and high pressure spool (N_2) speeds. The twin-spool engine is fitted with a variable primary nozzle that enables the jet pipe pressure to be varied. The jet pipe pressure acts upon the low pressure spool thus allowing controlled variation of N_1 without affecting the N_2 speeds. This facility allows matching of the N_1 and N_2 speeds in a series of engine control schedules that allow optimum operation of the engine while ensuring adequate compressor surge margins throughout the operating range of the engine.

The four schedules are, flyover, high, mid and low.

Flyover (F/O) is required during flyover noise abatement at speeds greater than 220 knots and for prolonged flying within the range M 0.80 to M 1.00 provided that the throttle levers are not advanced more than 95% of travel.

High (HI) is required during dry engine operation at speeds greater than 220 knots. It provides maximum fuel economy.

Mid is required during reheated engine operation in CLIMB rating at speeds greater than 220 knots. Mid also protects against excessive N_1 overspeed when reheat is cancelled and during the approach for noise abatement to touch down.

Low (LO) is required during dry engine operation at speeds less than 220 knots and during reheated engine operation in T/OFF rating at any speed; it also protects against excessive N_1 overspeed when reheat is cancelled.

The engine limiters automatically control the engines to the limitations appropriate to the prevailing phase of flight. Thus the need for fine tuning of the throttle levers to remain within limitations is avoided and the throttle levers are only used when thrust below the appropriate limitation is required. The engine limiters are by switch action.

ENGINE IGNITION

There are two igniters per engine, identified as left hand and right hand. They may be used together or individually.

An auto-ignition system provides a rapid automatic relight facility. The N_2 rpm is monitored and should a rapid decay of N_2 occur, or N_2 fall below 58%, the auto ignition system signals the engine fuel throttle valve to close, the start pump to run and the ignitors to spark. When light-up of the engine is detected the fuel throttle valve is opened to correspond to the throttle lever position and the start pump, together with the ignitors, is switched off.

ENGINE STARTING

The engines are started by low pressure air acting on an air starter to crank the engine. The air may be supplied independently to each wing from a ground supply or cross bled from the adjacent engine if it is already running.

DEBOWING

Following an engine shutdown, cooling of the engine interior is not uniform and the temperature differences are such that the high pressure spool shaft distorts. Starting the engine in this condition causes vibration. Therefore it is necessary during starting to rotate the engine at sub-idle rpm for one minute to obtain uniform temperatures and to re-align the high pressure spool shaft. This operation is automatic and is known as debowing.

ENGINE RELIGHTING

The auto ignition system will normally operate in the event of engine flame out, however, should it fail to provide an immediate relight a manual relight facility is provided.

Emergency relight busbars are used to relight the engine(s) after loss of the a.c. main busbars.

SECONDARY NOZZLE

The variable area secondary nozzle is formed by the thrust reverser buckets. The secondary nozzle is positioned fully open at speeds greater than $M = 1.1$. At lower speeds a nozzle angle scheduling unit (NASU) positions the secondary nozzle as a function of Mach number and also provides the appropriate signals for the automatic selection of the engine control schedules. There are two NASU systems; No.1 system signals engines 1 and 4 and No.2 system signals engines 2 and 3.

Protection against inadvertent bucket movement toward the reverse thrust position is afforded in the following manner. Should the buckets move beyond the 27 degree position an air shut off valve cuts the air supply to the bucket drive motor. This should prevent bucket movement beyond 35 degrees, if however the buckets move beyond 42 degrees a "wind down" system operates and signals via the selected throttle control system a reduction of N_2 to idle.

REVERSE THRUST

Reverse thrust is provided on all four engines for use on the ground.

Reverse thrust may also be used in flight but is limited by a control system such that only two engines (2 and 3) are used and these only at reverse idle power.

This limitation is necessary because at altitude insufficient bleed air is available from one engine to move its own buckets to the reverse position; to overcome this problem bleed air from No.1 engine assists No.2 engine and bleed air from No.4 engine assists No.3 engine.

When the secondary nozzle buckets on each engine are being used as thrust reversers the buckets are fully closed (73 degrees) across the jet discharge to deflect the exhaust gas above and below the nacelle through gaps created by the forward edges of the buckets.

Control of the thrust reverse mode of the buckets is direct to bucket control units and does not pass through the NASU's.

AUTOMATIC SHUTDOWN

To prevent severe turbine overspeed and minimise damage should the low pressure compressor shaft fail, an automatic quick engine shutdown device is provided. A signal tube within the LP shaft enables relative twisting movement between front and rear sections of the LP shaft to be detected. Excessive shaft twisting causes operation of a mechanical device that operates a quick shut down valve and high speed fuel dump in the burner fuel line.

NOZZLE ANGLE SCHEDULING UNIT

The NASU system automatically positions the clamshell type buckets, when they are being used in their secondary nozzle mode, as a function of Mach number. The control is achieved through bucket control units on each power plant.

There are two NASU's and normally each NASU controls two symmetrically disposed bucket control units, there being one bucket control unit per engine. In the event of failure of a NASU the remaining NASU automatically signals all four bucket control units and if both NASU's fail the secondary nozzle will be signalled to 0° bucket angle.

In addition to the secondary nozzle control the NASU's also control through the throttle control units;

- the selection of the Engine Control Schedules in AUTO mode,
- the engine limiters in CRUISE rating and
- signal the closing of the air shut off valve on the air motor that drives the buckets at speeds above $M = 1.2$.

In the event of a failure of a NASU some of the signals to the throttle control units are supplied by the other NASU. Some signals are still supplied by the NASU which is nominally off line, except when the failure is caused by a NASU power supply loss, in which case all signals from the failed NASU are lost.

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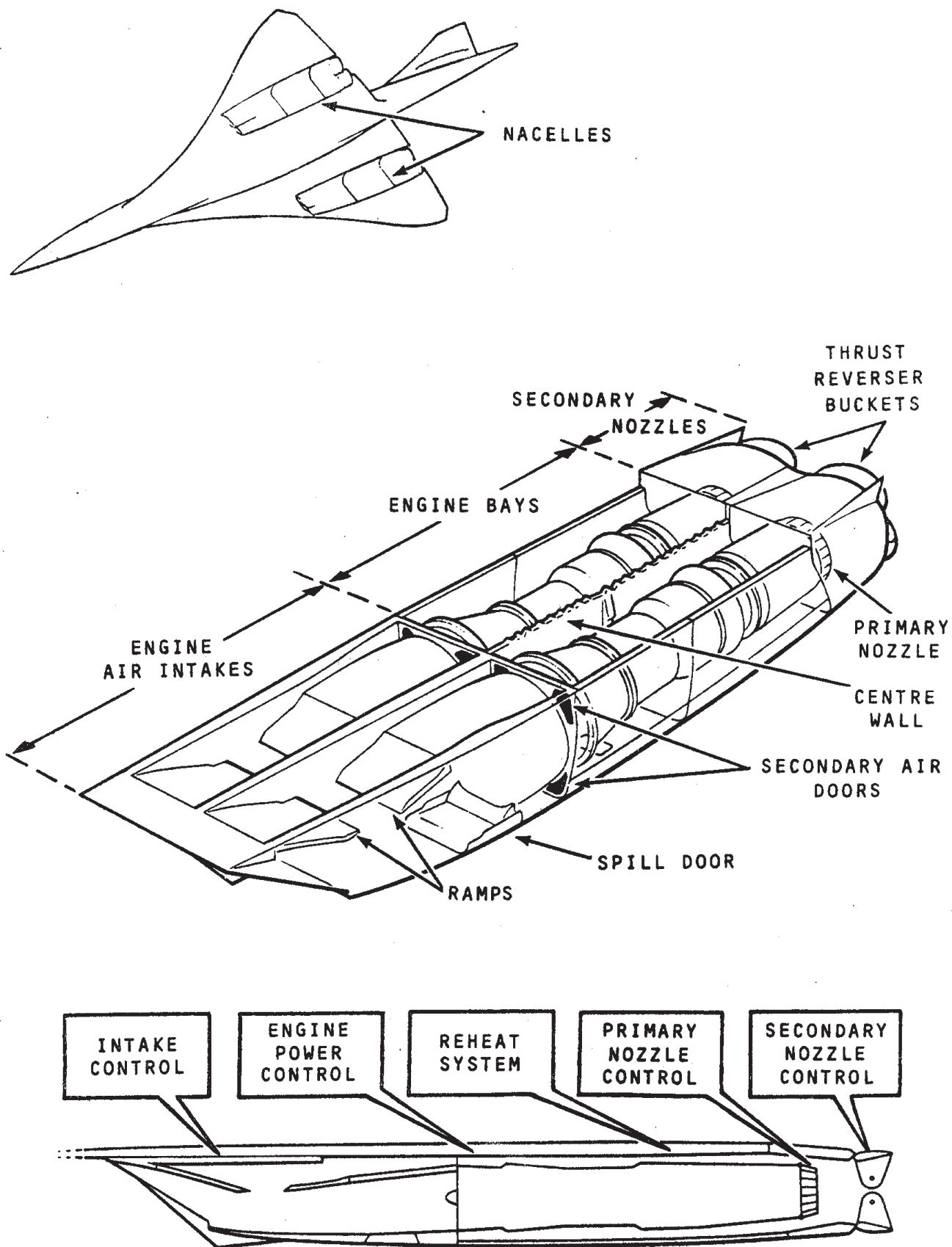
GROUND IDLE

A facility is provided to reduce the idle thrust on the ground.

TAKE OFF N_1 LIMITER

A facility is provided to limit the N_1 of engine number 4 to a maximum of 88% below 60 knots. This is necessary because airflow patterns within the intake at forward speeds below 60 knots cause airflow distortion at the engine face leading to LP compressor blade vibration at N_1 greater than 88%.

POWER PLANT GENERAL ARRANGEMENT



(unchanged)

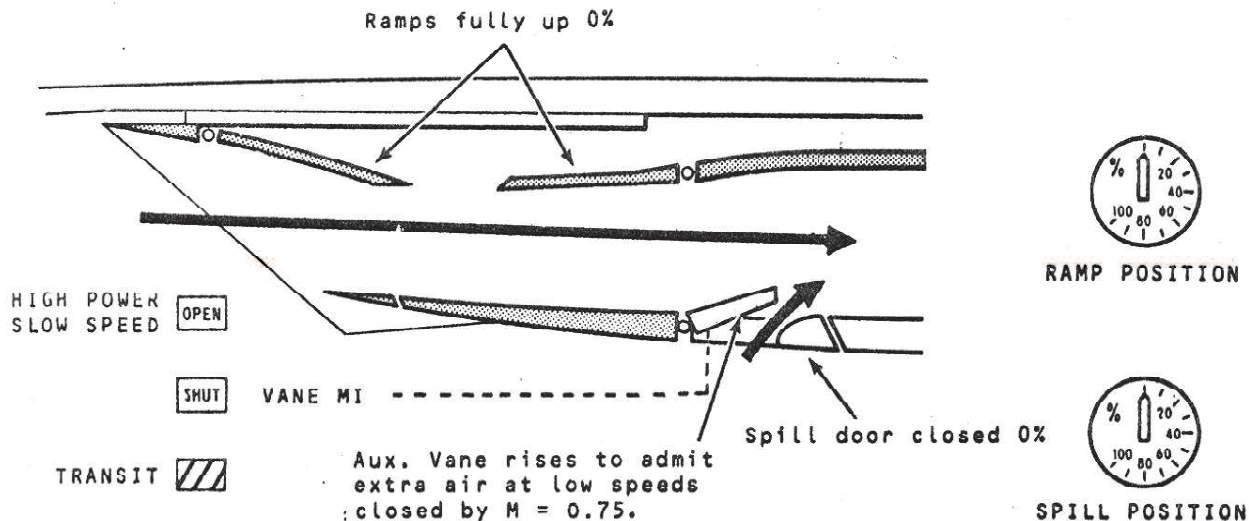
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INTAKE CONFIGURATION

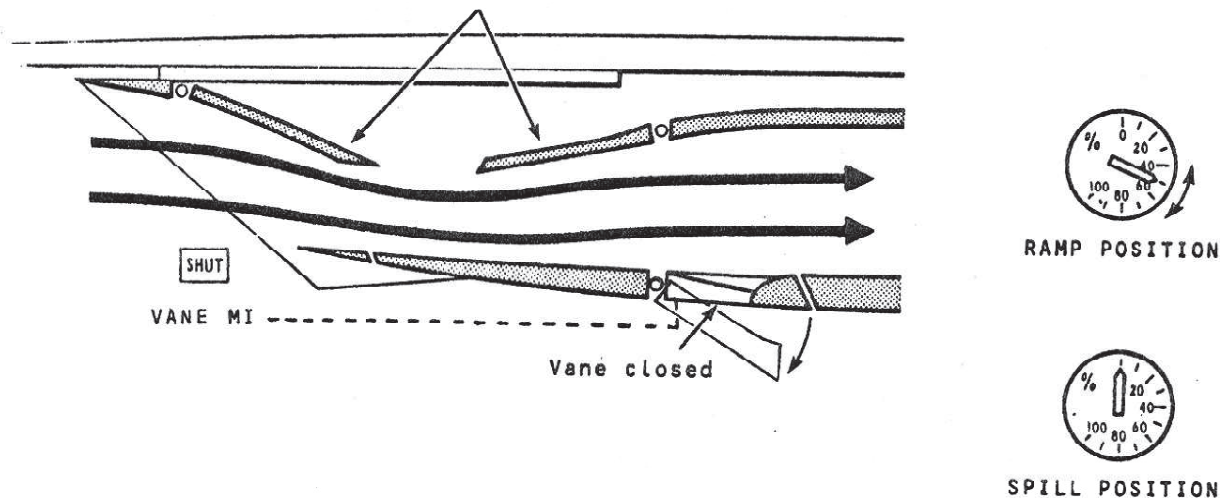
INTAKE CONFIGURATION BELOW $M = 1.3$



Ramps may lower and spill door open if engine fails above $M = 0.7$.
or if the engine is throttled to idle.

INTAKE CONFIGURATION ABOVE $M = 1.3$

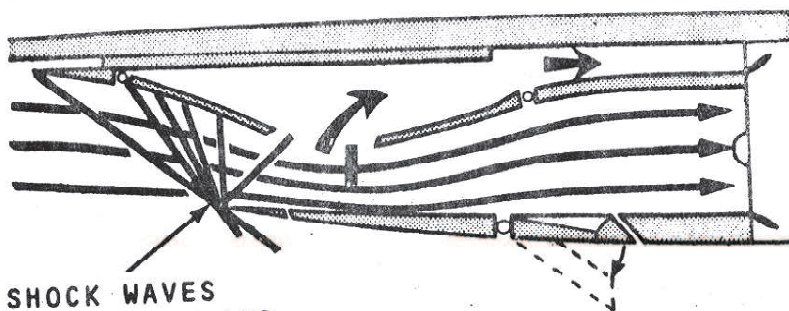
Ramps lowering with increasing mach; Approx. 50% by $M = 2.02$.
Ramps will move as intake compensates for ambient temperature changes or engine throttling.



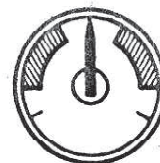
Spill door normally closed, but may open to dump excess air from intake if engine throttled back or ambient temperature very high.

INTAKE SUPERSONIC AIRFLOWS

CRITICAL (NORMAL) CONDITION



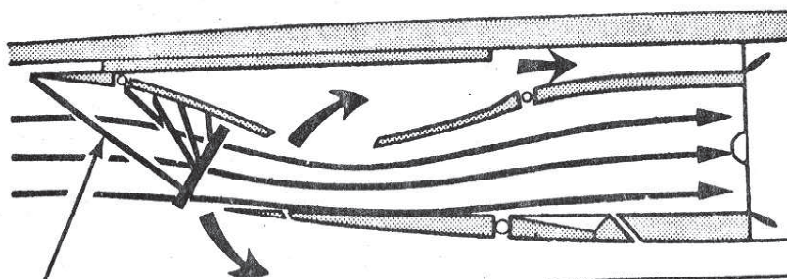
SHOCK WAVES
FOCUSED ON LIP



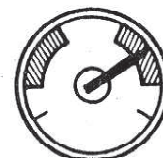
INTAKE PRESSURE RATIO
ERROR INDICATOR

1. ENGINE THROTTLED BACK OR AMBIENT TEMPERATURE INCREASED	RAMPS MOVE DOWN TO COMPENSATE FOR REDUCED ENGINE DEMAND SPILL DOOR MAY OPEN
2. AMBIENT TEMPERATURE DECREASED	RAMPS MOVE UP TO COMPENSATE FOR INCREASED ENGINE DEMAND N ₁ MAY BE AUTOMATICALLY REDUCED

SUBCRITICAL CONDITION

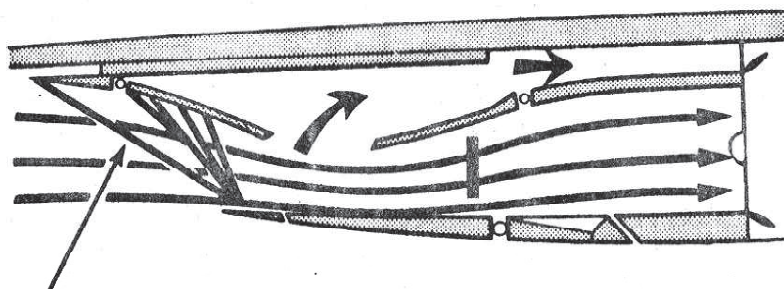


SHOCK WAVES PUSHED OUT
OF INTAKE, CAUSING
UNCONTROLLED SPILLAGE
OF AIR ROUND LIP

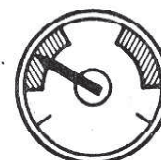


IF CONTROL SYSTEM FAILS TO
MOVE RAMPS TO COMPENSATE
FOR REDUCED ENGINE DEMAND

SUPERCRITICAL CONDITION



SHOCK WAVES SUCKED
INTO INTAKE

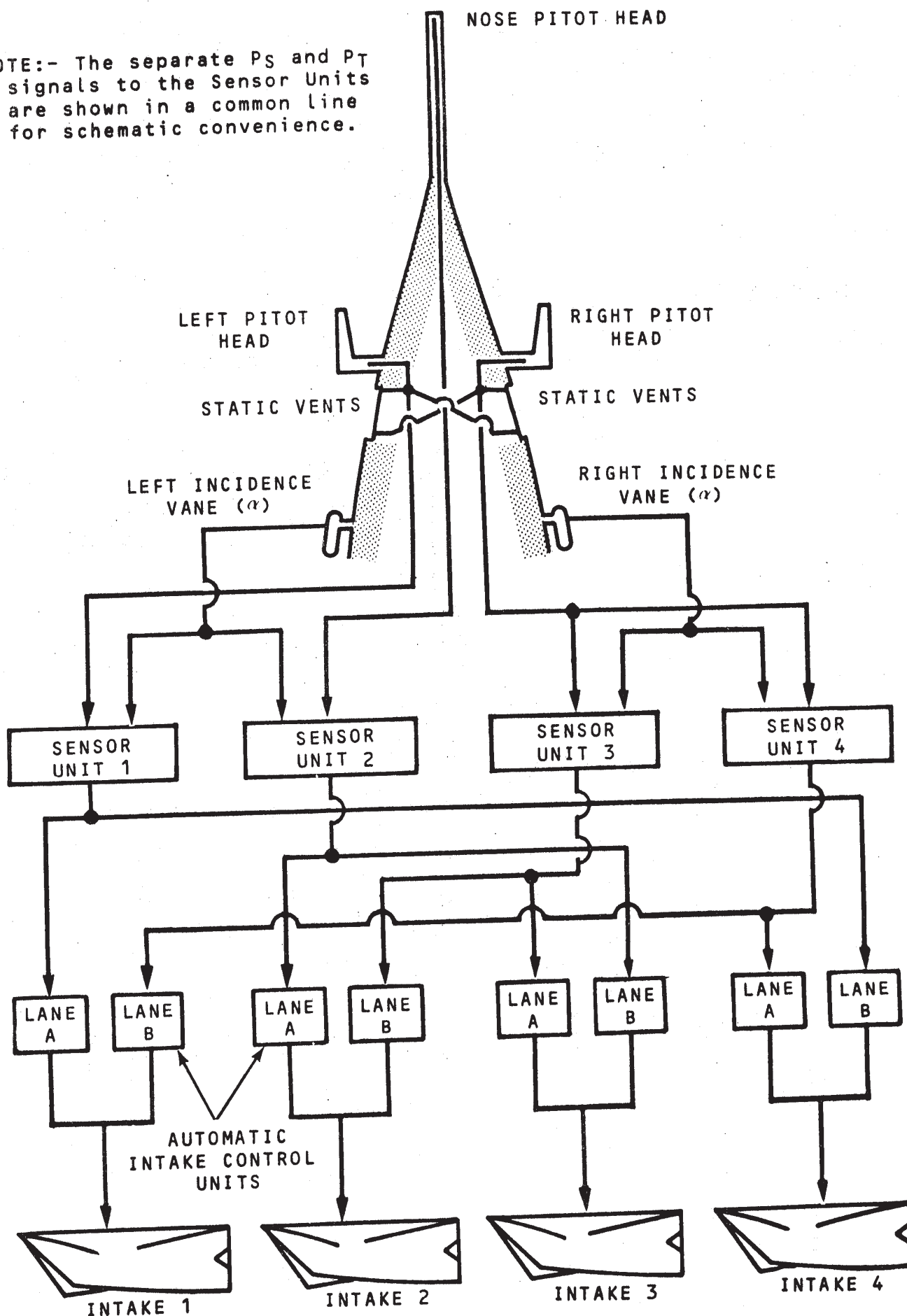


IF CONTROL SYSTEM FAILS TO
MOVE RAMPS TO COMPENSATE
FOR INCREASED ENGINE DEMAND

18.02.04
21 Jul.76

INTAKE CONTROL GENERAL ARRANGEMENT

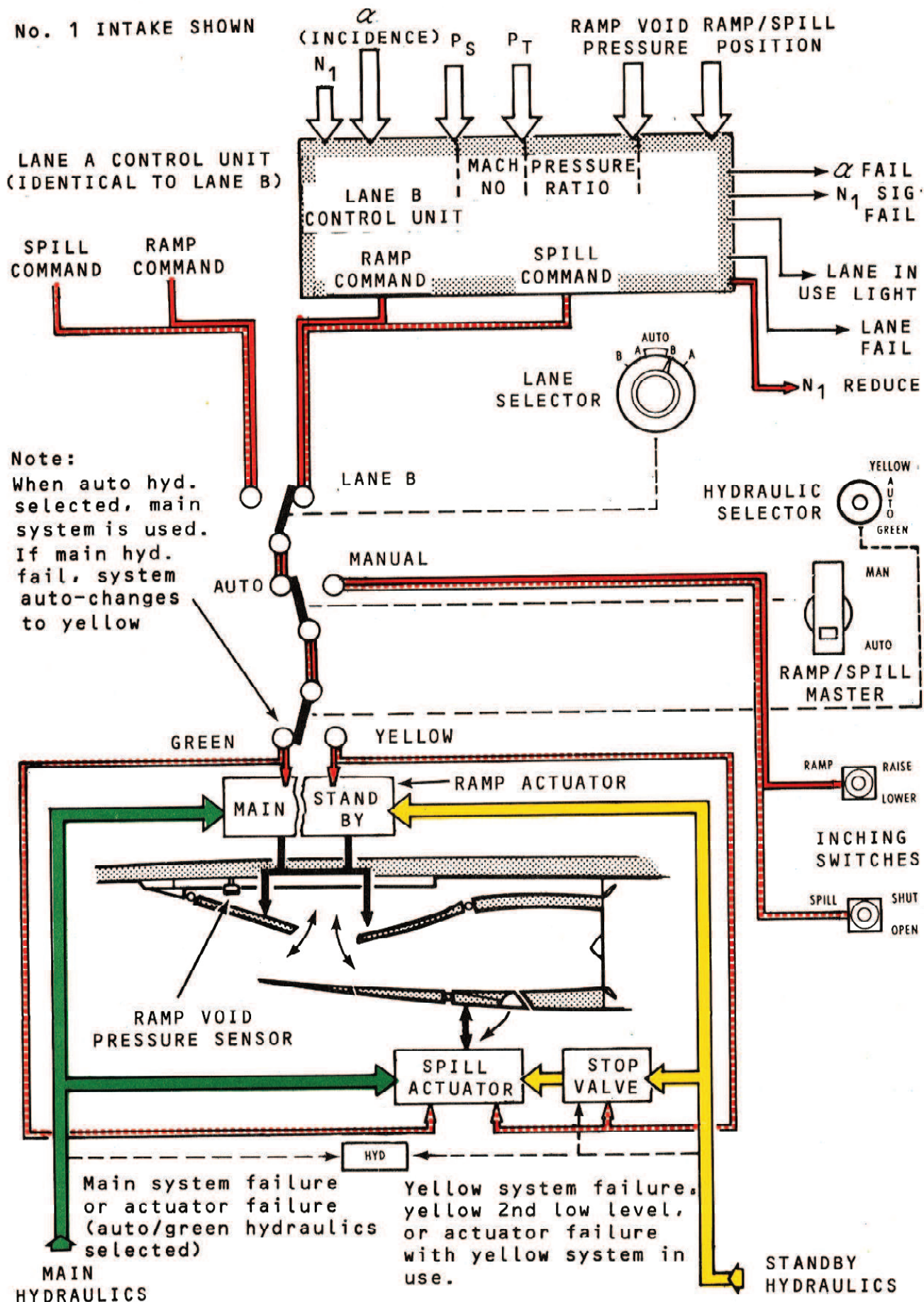
NOTE:- The separate Ps and Pt signals to the Sensor Units are shown in a common line for schematic convenience.



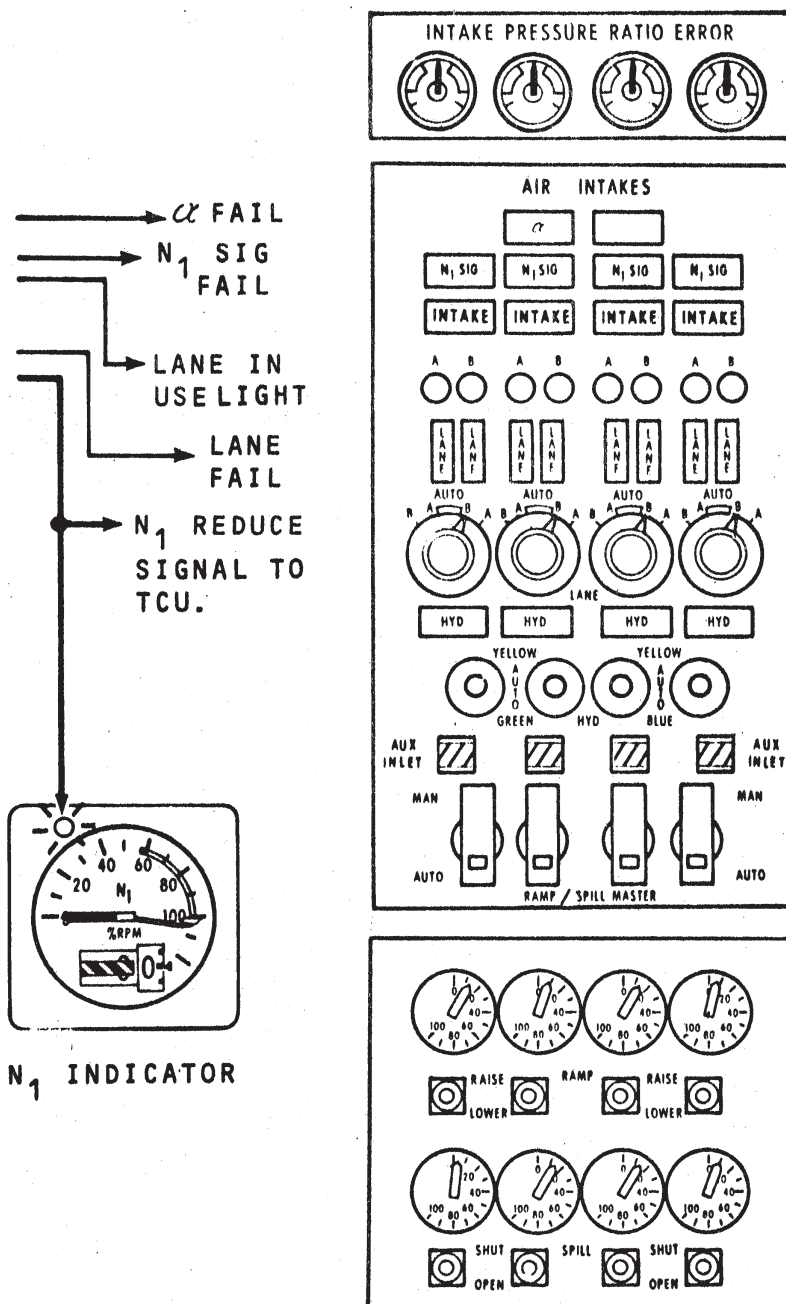
Intentionally left blank

INTAKE CONTROL SCHEMATIC

(Sheet 1 of 2)



INTAKE CONTROL SCHEMATIC
(Sheet 2 of 2)

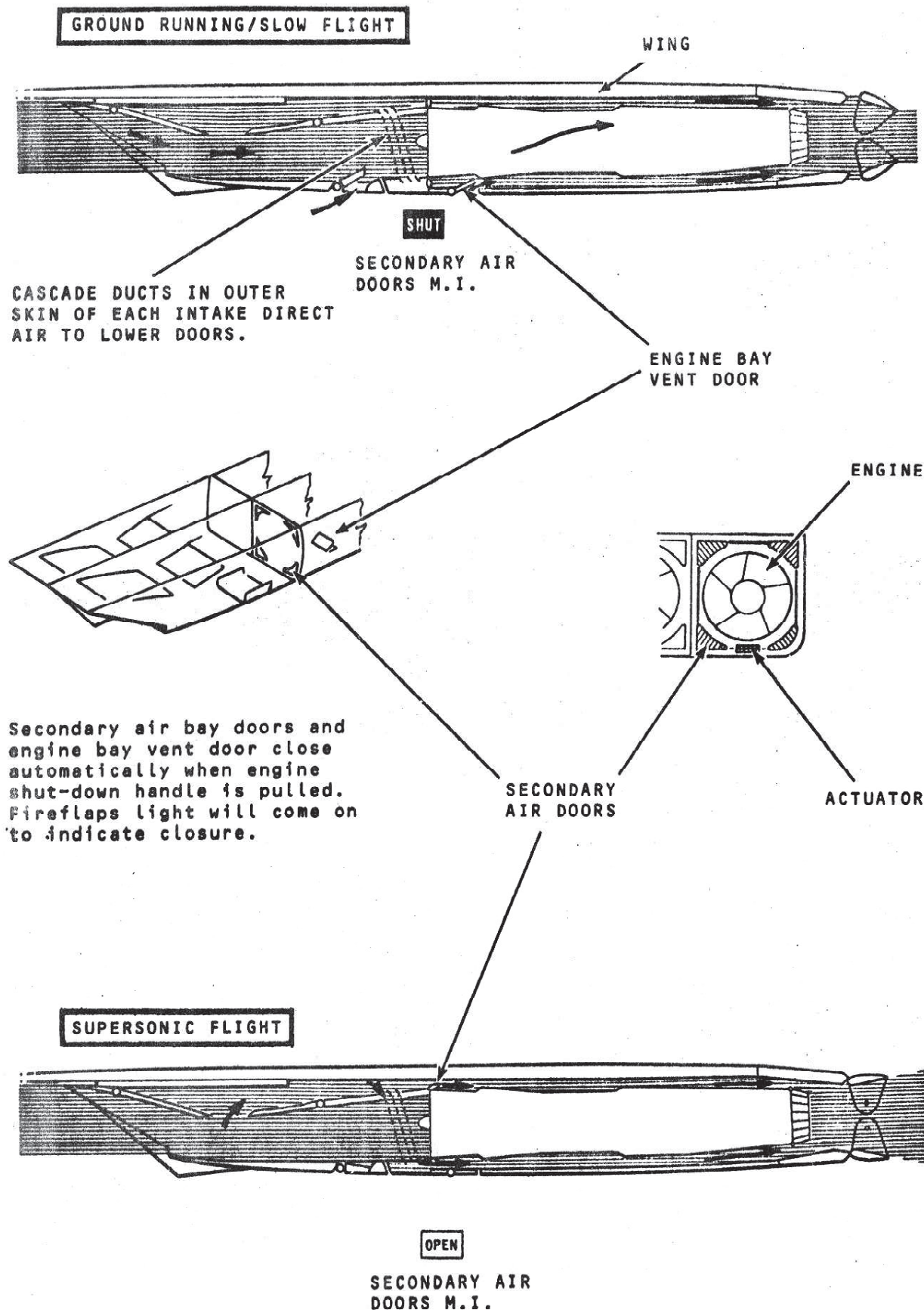


NOTE:

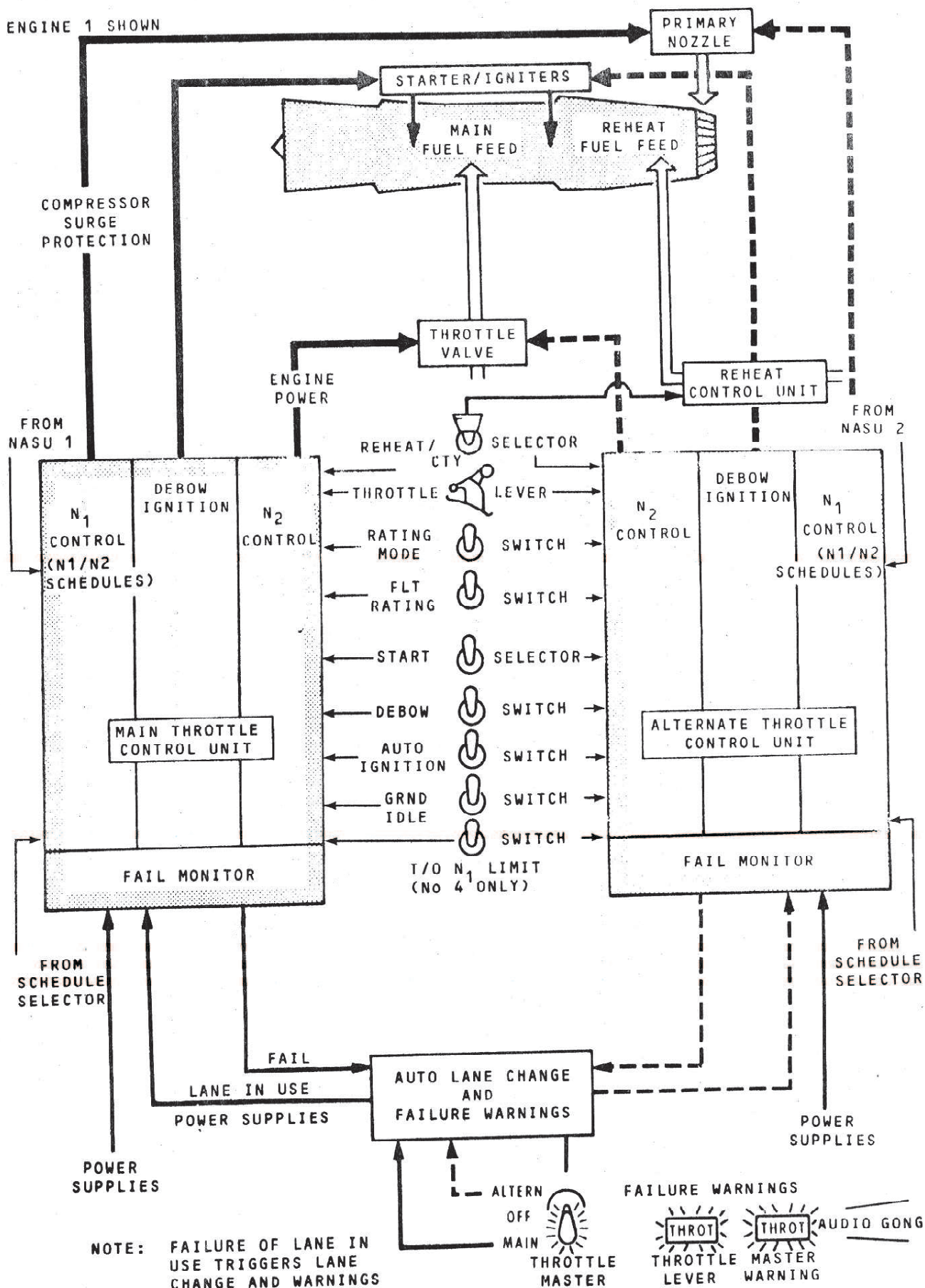
- 1 RED 'INTAKE' LIGHT ON TO SIGNAL LOSS OF AUTOMATIC CONTROL OF INTAKE
- 2 HYDRAULIC SUPPLIES:-

INTAKES	MAIN	STANDBY
1 and 2	GREEN	YELLOW
3 and 4	BLUE	YELLOW

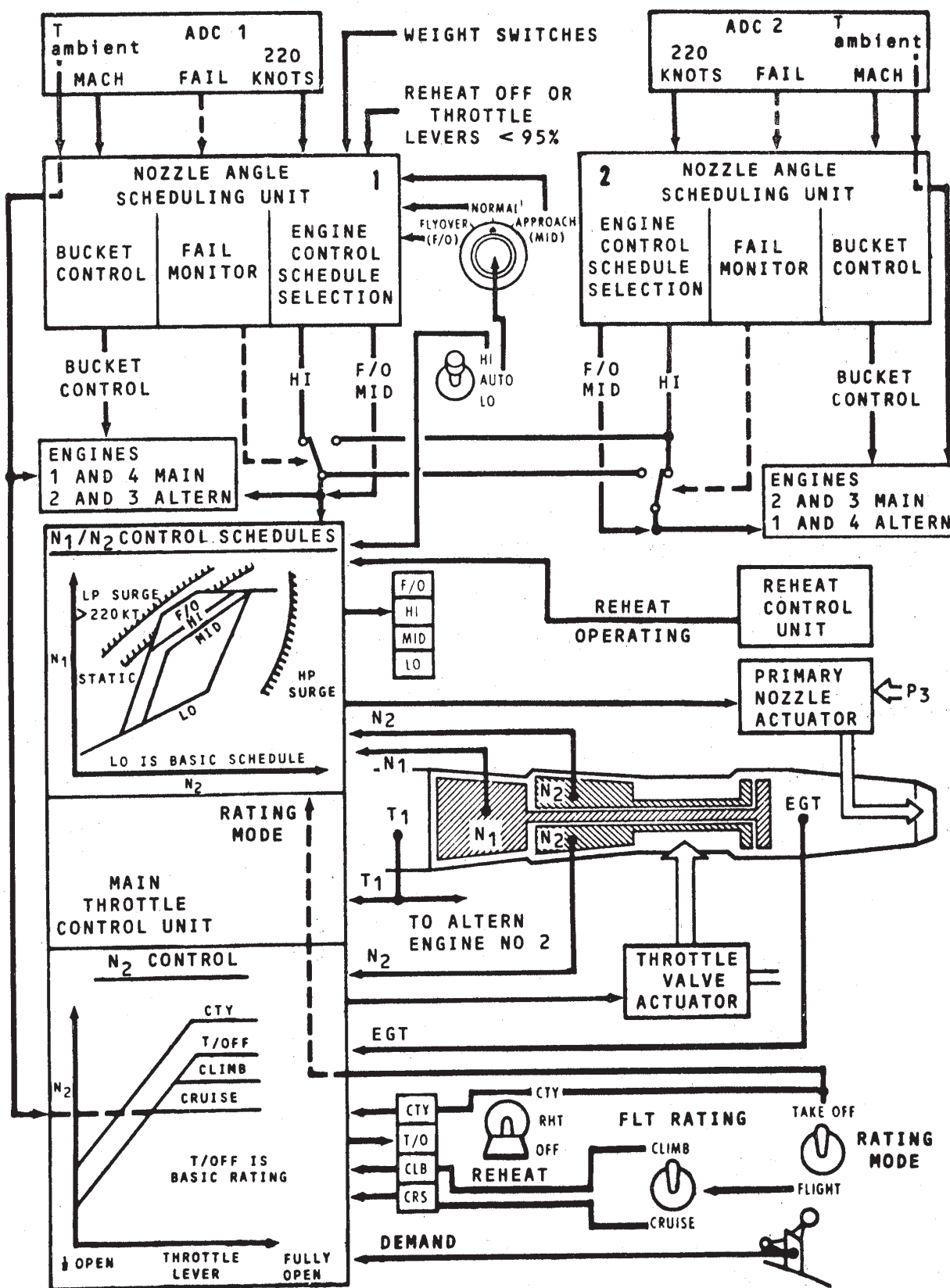
NACELLE VENTILATION



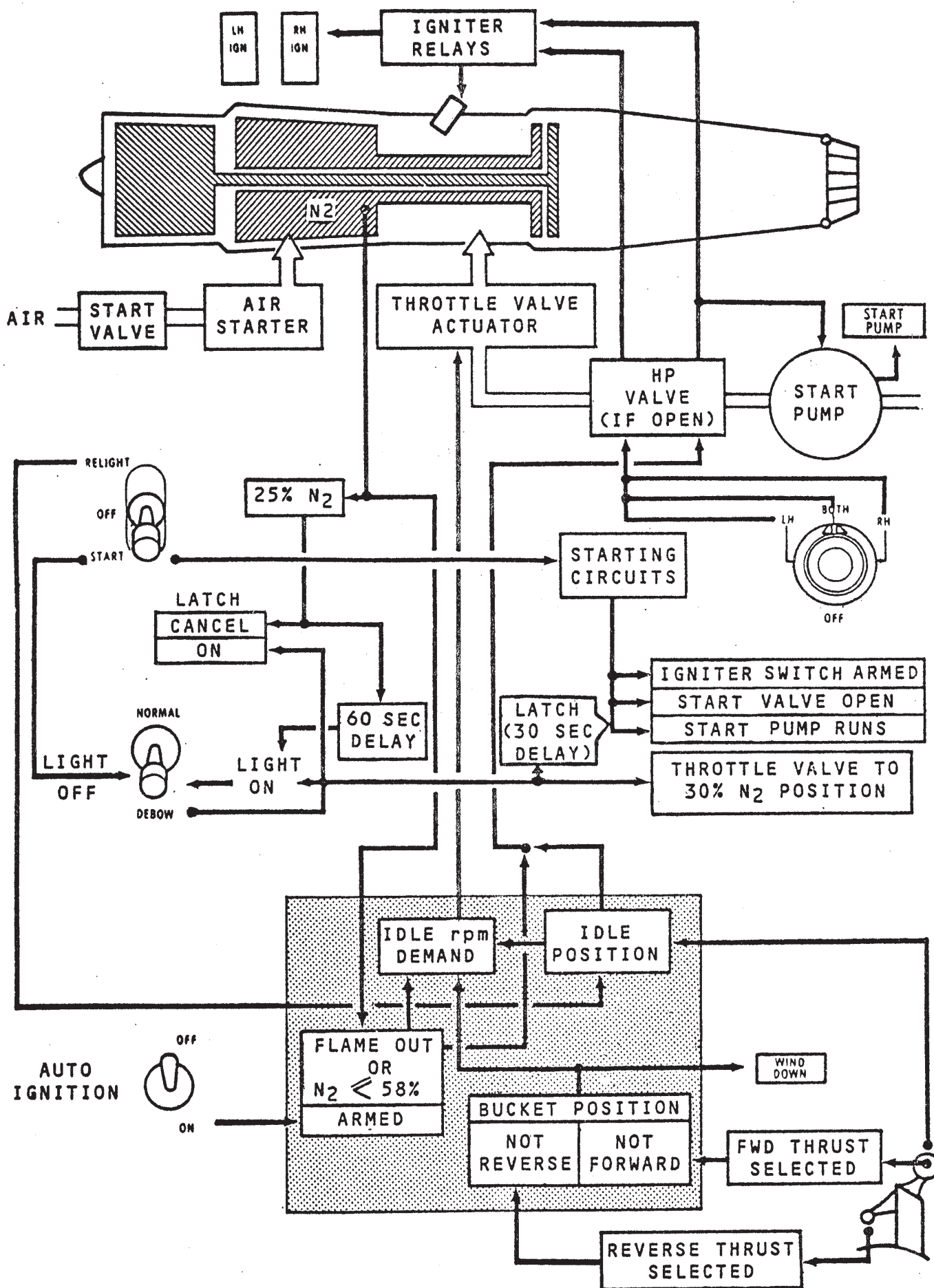
BASIC ENGINE CONTROL



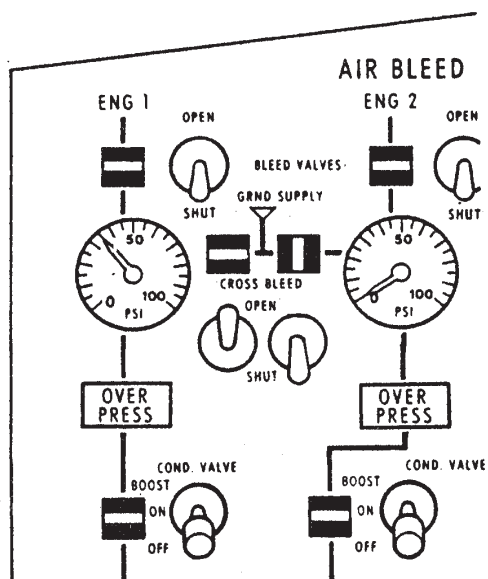
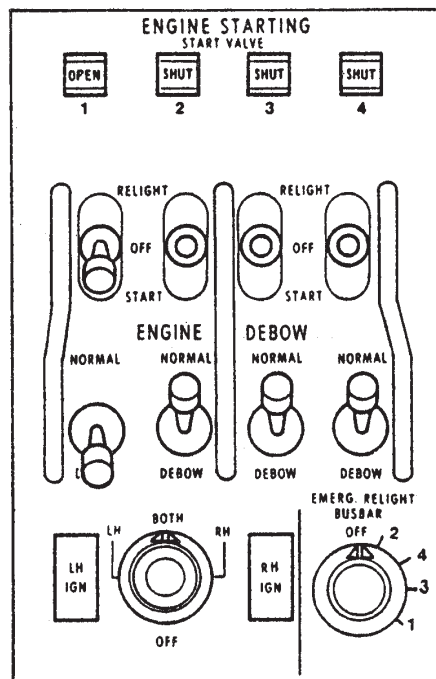
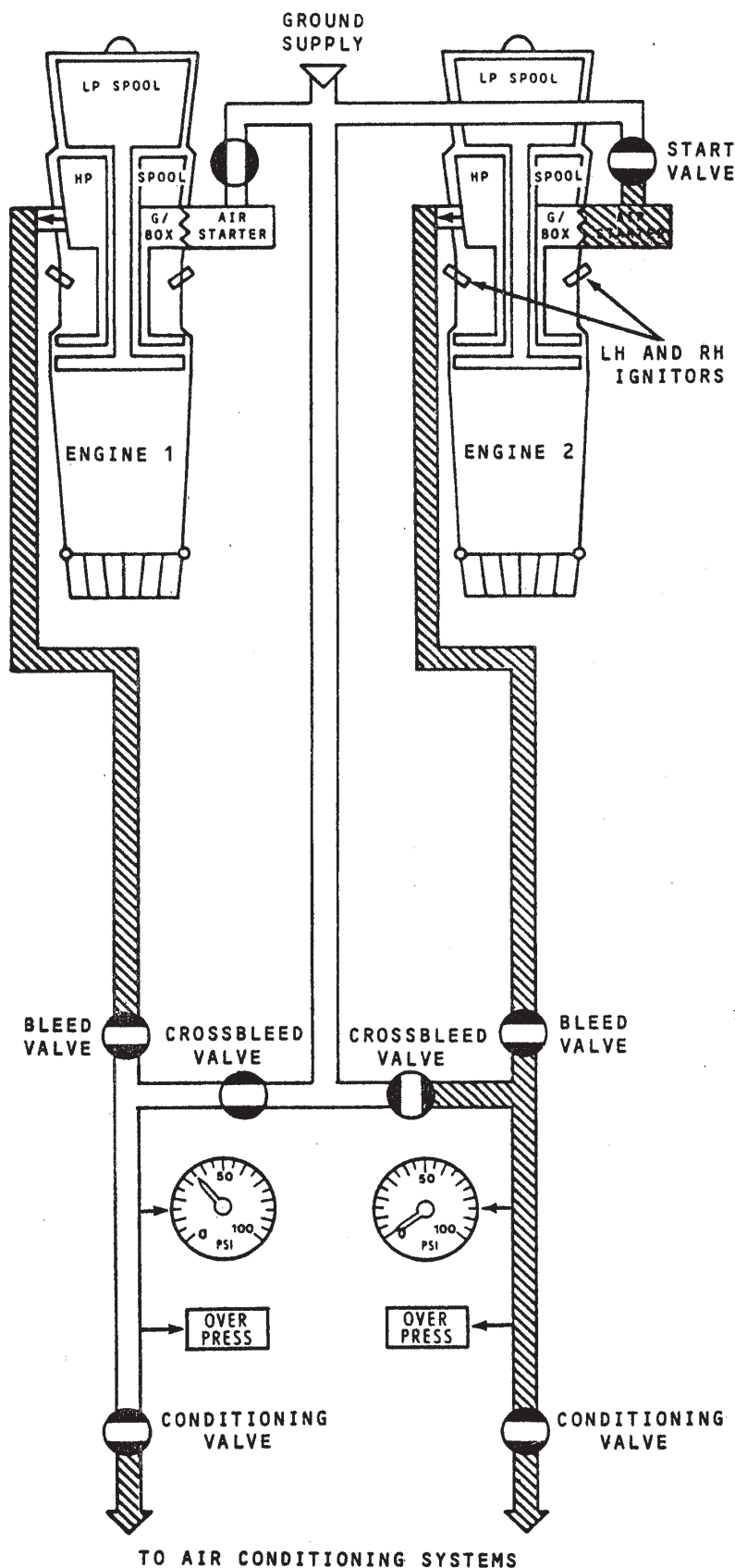
BASIC ENGINE CONTROL. ENGINE 1



ENGINE CONTROL.
WIND DOWN, IGNITION AND STARTING

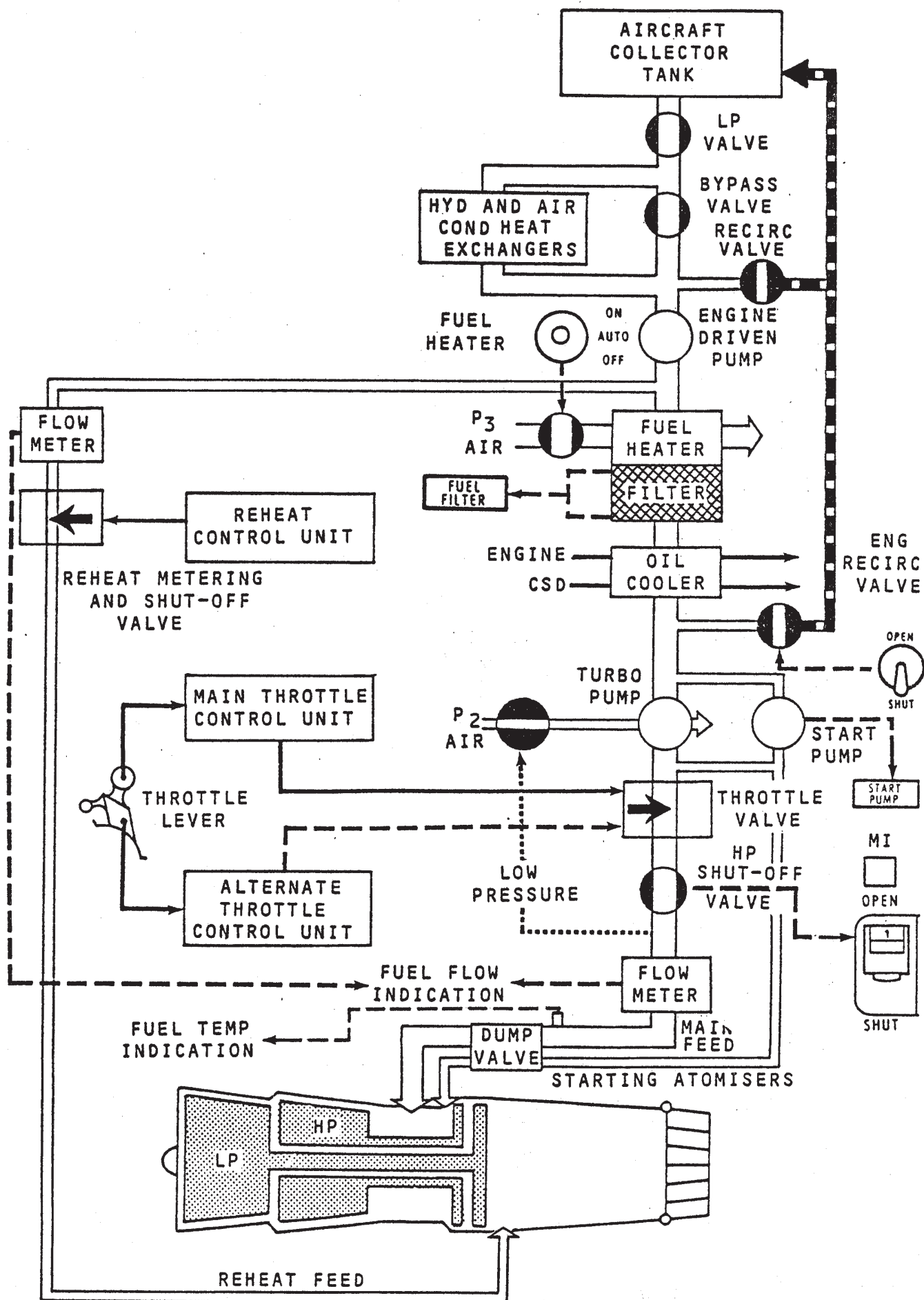


ENGINE STARTING - AIR SUPPLIES



(Unchanged)

ENGINE FUEL FEED SCHEMATIC

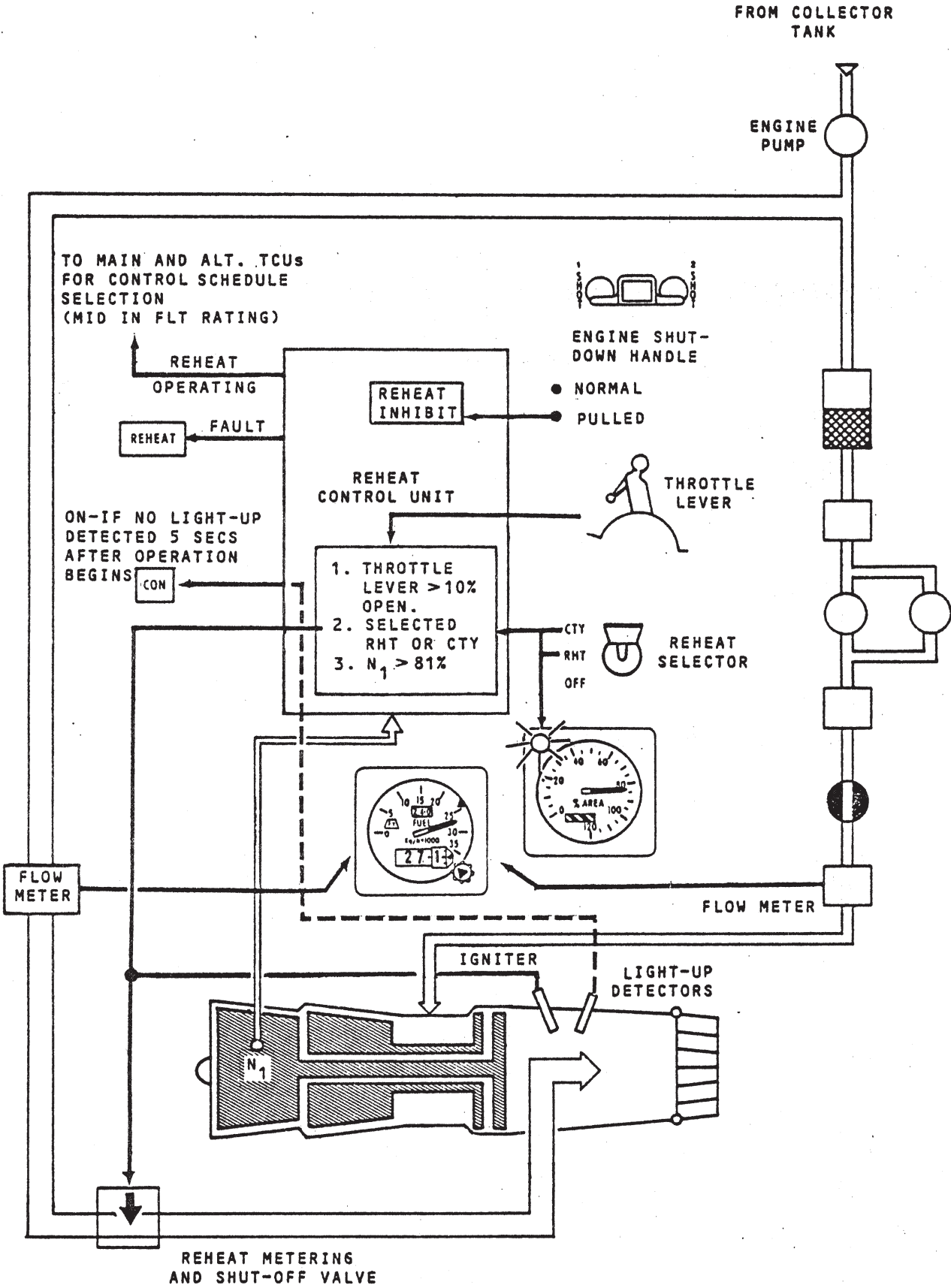


18.02.14
1 DEC.76

CONCORDE FLYING MANUAL
POWER PLANT

British airways
OVERSEAS DIVISION

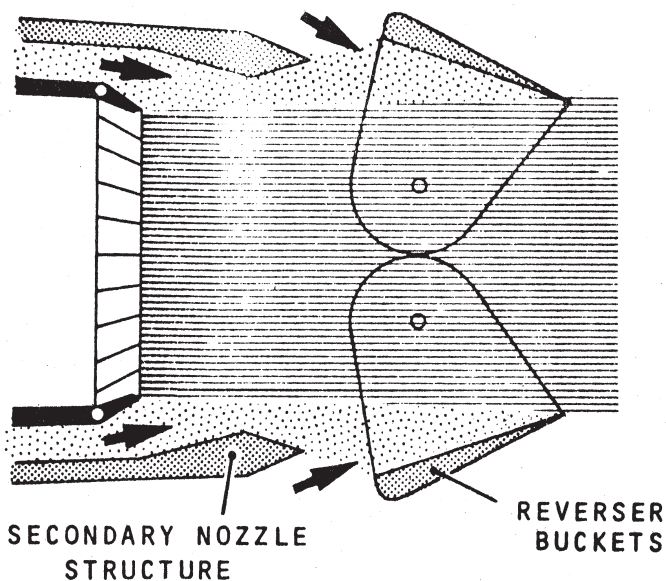
REHEAT SYSTEM SCHEMATIC



PRINTED IN ENGLAND

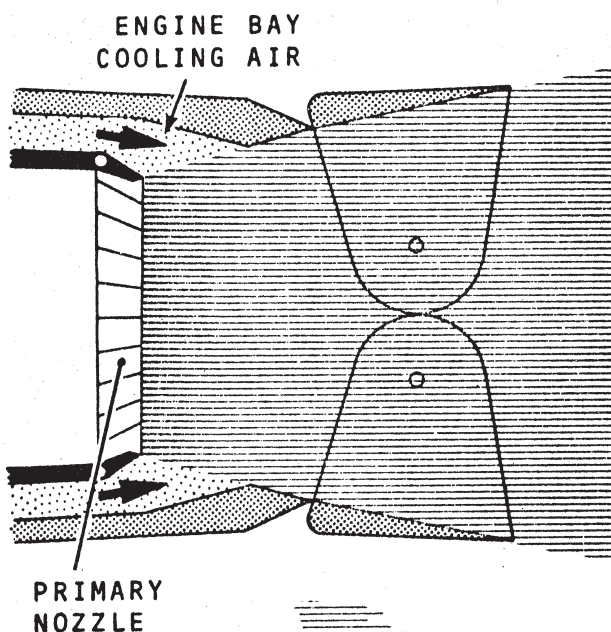
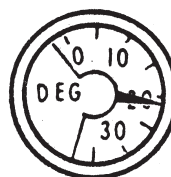
(Unchanged)

BUCKET CONFIGURATION



GROUND RUNNING, TAKE OFF,
SLOW SPEED FLIGHT $M < 0.55$
BUCKET POSITION 21°

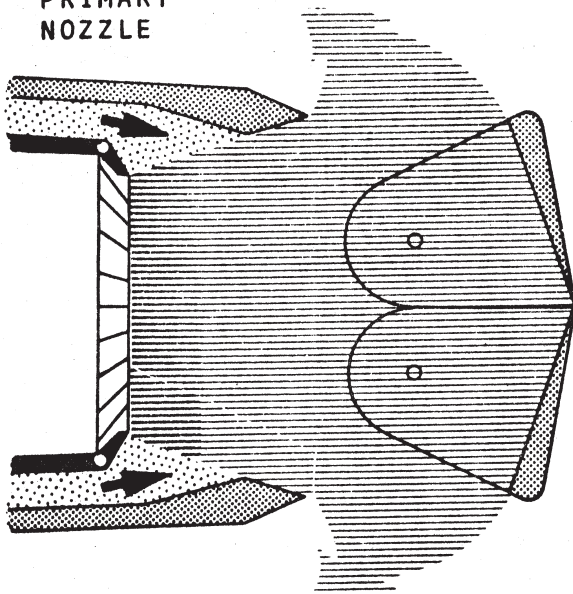
Buckets are set to contain slowly expanding exhaust gases and prevent induction of ambient air around trailing edge which would cause drag.



BUCKETS MODULATING $21^\circ - 0^\circ$
BETWEEN $M = 0.55$ AND $M = 1.1$

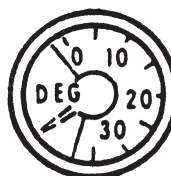
SUPERSONIC FLIGHT $M > 1.1$
BUCKET POSITION 0°

Buckets are set to form divergent duct to contain rapidly expanding exhaust gases and augment thrust.

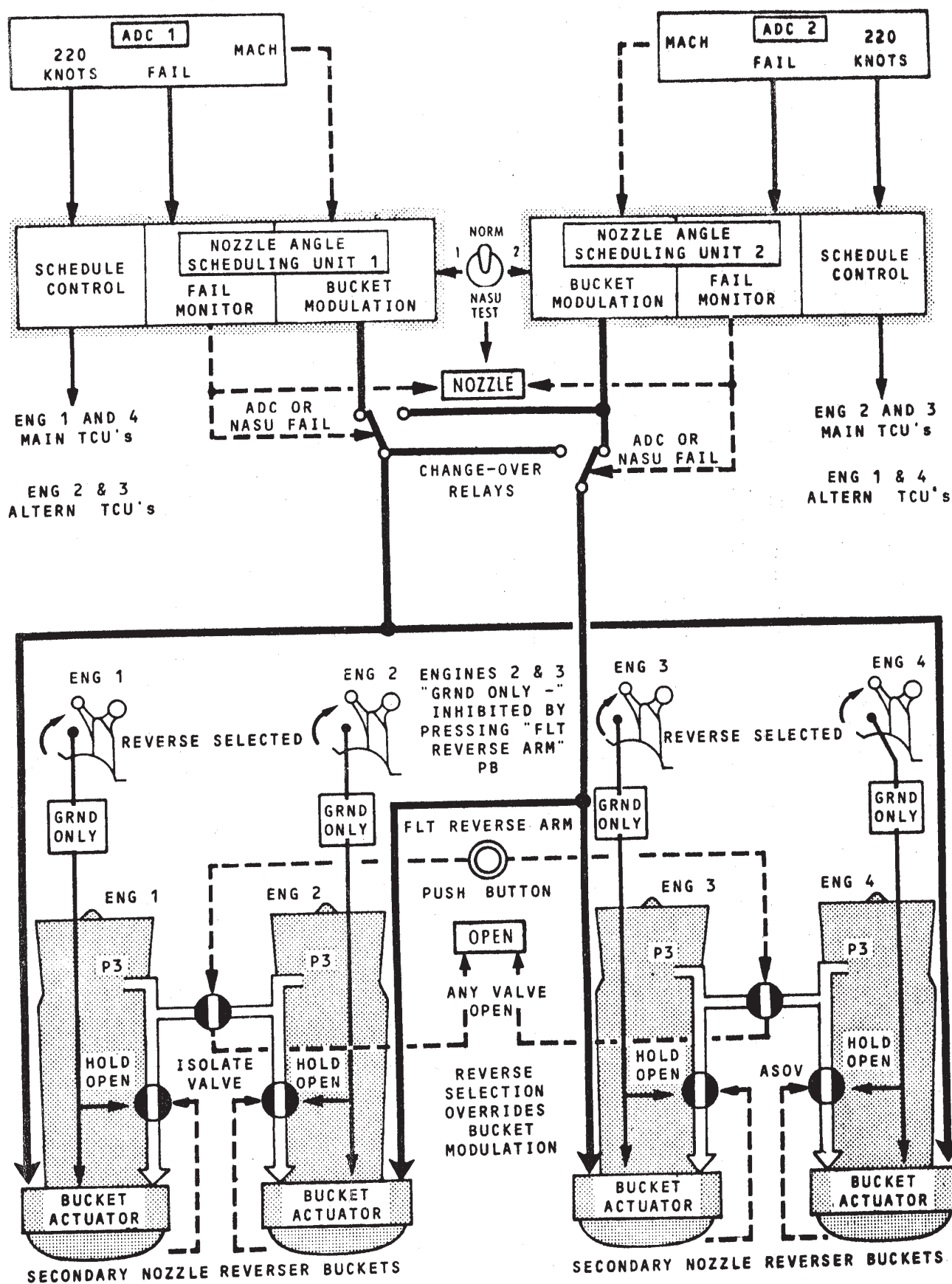


REVERSE THRUST
BUCKET POSITION 73°

Primary nozzle is closed to increase exhaust gas velocity and thus increase aerodynamic braking effect.

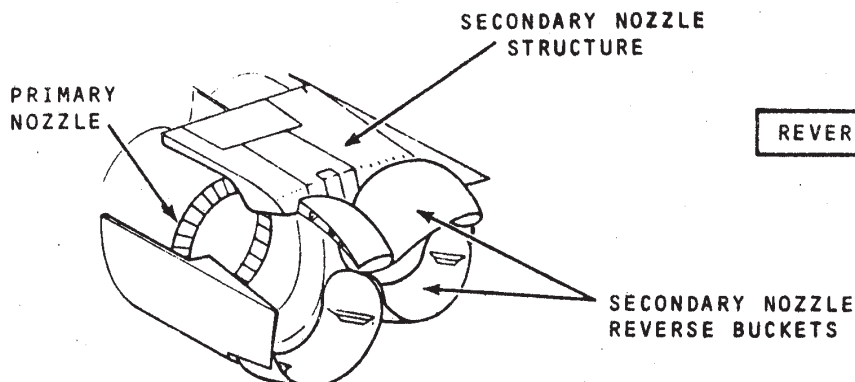


SECONDARY NOZZLE/REVERSER THRUST CONTROL



ASOV WILL CLOSE IF BUCKETS REACH 27° UNLESS REVERSE HAS BEEN SELECTED

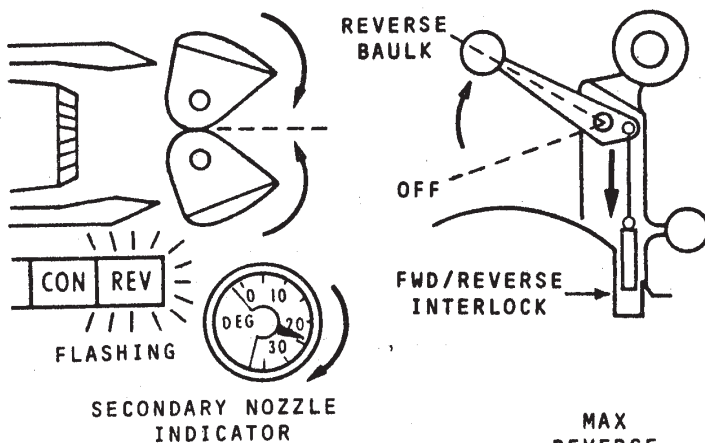
REVERSE THRUST-GROUND



REVERSE THRUST OPERATION

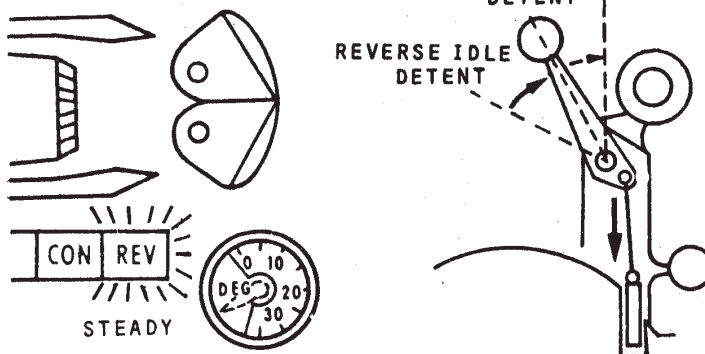
REVERSE THRUST SELECTED

1. Buckets signalled to reverse
2. N_2 increased to 72%
3. ASOV held open
4. Reverse baulk inhibits further lever movement rearwards.



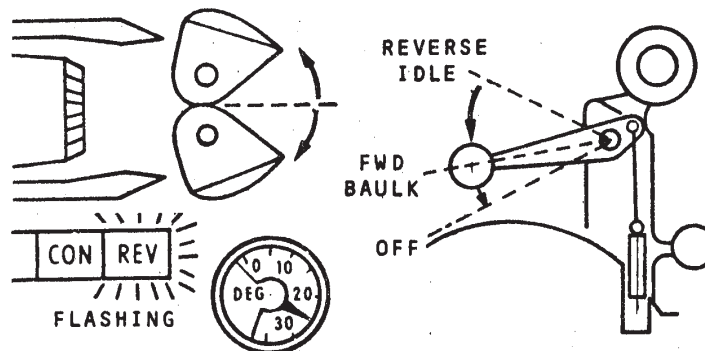
BUCKETS AT REVERSE

1. Reverse baulk released providing a/c on ground.
2. Primary nozzle signalled to $< 15\%$
3. CON light on if primary nozzle area greater than 15% (after 5 secs)
4. Reverse lever may be pulled back to increase reverse power.
5. Reverse idle detent prevents inadvertent de-selection when reducing power.



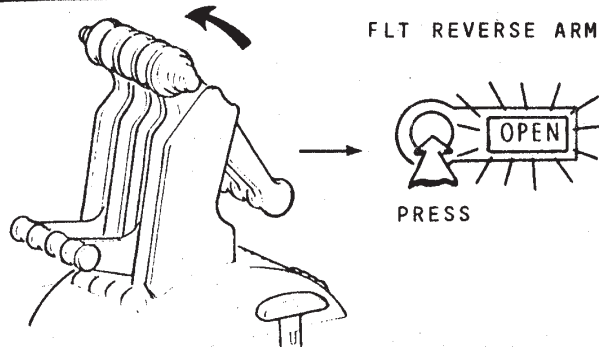
REVERSE THRUST DE-SELECTED

1. Lever baulked until buckets reach forward thrust range $0^\circ - 21^\circ$
2. REV light flashing whilst buckets in transit, then off.
3. FWD/REVERSE interlock engaged until baulk released and lever set to the OFF position.
4. Adjacent baulk o/ride lever may be used if baulk fails to release.



REVERSE THRUST-FLIGHT

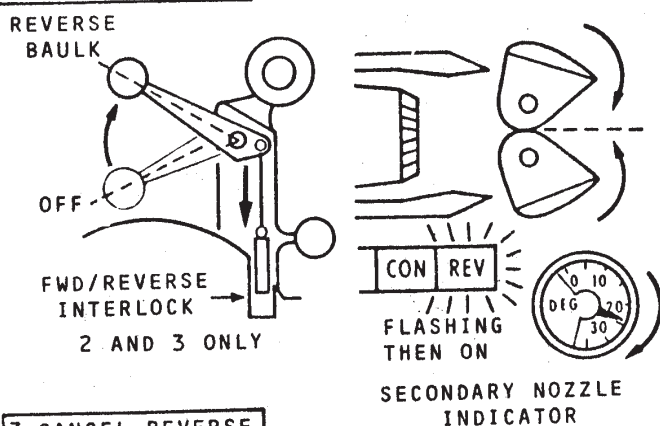
1. ARM SYSTEM



1. Button latches in
2. Isolate valves (P₃ interconnect) open - light ON.
3. Flight reverse system armed

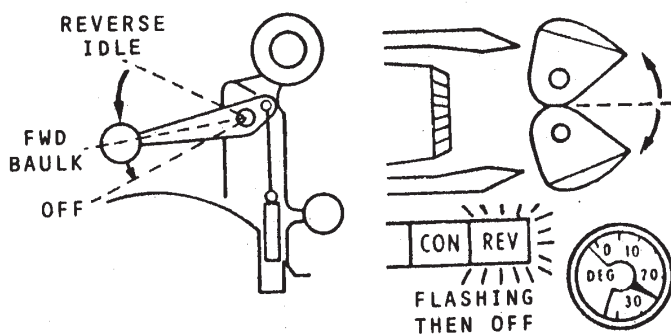
IDLE

2. SELECT REVERSE



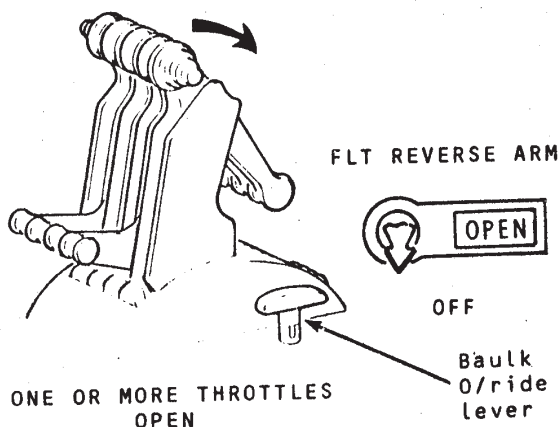
1. 2 and 3 levers to reverse baulk (NOT released in flight).
2. 2 and 3 buckets to reverse
3. During bucket transit:-
(i) 2 and 3 primary nozzles to MAX-
(ii) 1 and 4 fuel flow increase both to reduce bucket transit time
(iii) 2 and 3 REV lights flashing
4. When buckets at reverse:-
(i) 2 and 3 primary nozzles to MIN
(ii) 1 and 4 fuel flow normal
(iii) 2 and 3 REV lights ON (CON light on after 5 secs if A_J > 15%)

3. CANCEL REVERSE



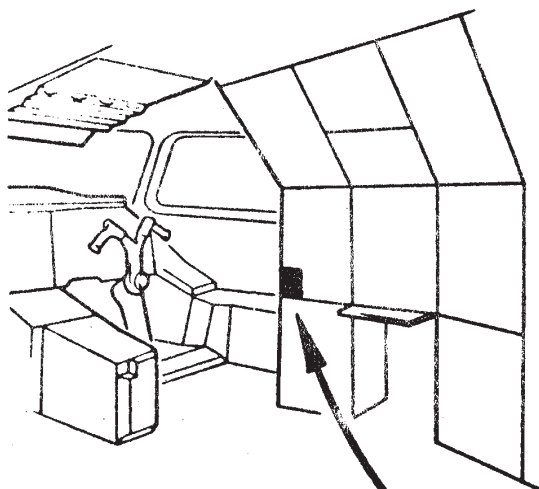
1. 2 and 3 levers to fwd baulk (released when buckets reach fwd thrust)
2. 2 and 3 buckets to fwd thrust
3. During bucket transit:-
(i) 2 and 3 primary nozzles to MAX
(ii) 1 and 4 fuel flow increase
(iii) 2 and 3 REV lights flashing
4. When buckets at fwd thrust:-
(i) 2 and 3 primary nozzles to normal
(ii) 1 and 4 fuel flow normal
(iii) 2 and 3 REV lights OFF.
5. 2 and 3 levers to OFF-use baulk o/ride if baulk fails to release.

4. DIS-ARM SYSTEM



1. Button latch cancels
2. Isolate valves close - light OFF
3. Flight reverse system dis-armed

INTAKE CONTROLS AND INDICATORS
(Sheet 1 of 3)



RAMP/SPILL MASTER SWITCH (4)

- MAN** - The RAMP AND SPILL inching switches are armed. The auto control of the air intake, the auto change facility of lane and hydraulics, together with yellow hydraulic system second low level cut off are inhibited. With the exception of the INTAKE light all intake warnings for the affected intake are inhibited.
- AUTO** - the intake control system controls the intake ramp and spill doors. Below $M = 0.7$ the ramp remains fully up and the spill door is closed.

RAMP INDICATOR (4)

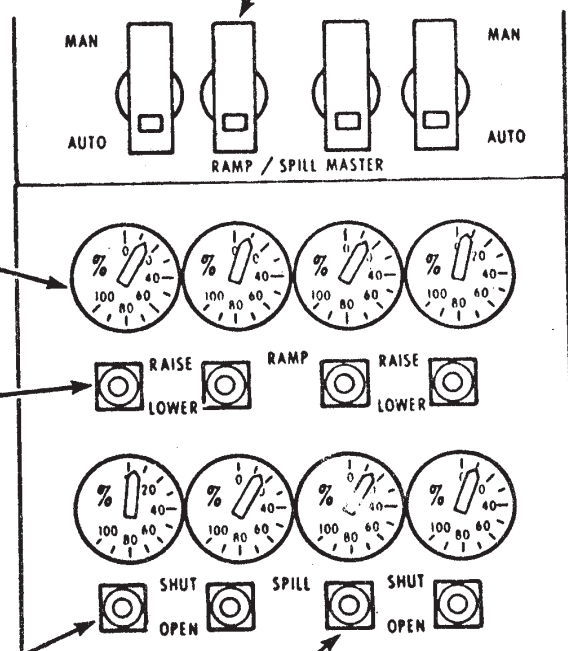
Show ramp position as a percentage of its movement from fully up. Loss of electrical supply to the indicator is shown by the pointer being off scale below 0%.

RAMP INCHING SWITCH (4)

Enables the ramp to be raised and lowered providing the RAMP/SPILL MASTER switch is at MAN and hydraulic pressure is available. It is spring returned to the centre position.

SPILL INDICATOR (4)

Show spill door position as a percentage of its movement from fully closed. Loss of electrical supply to the indicator is shown by the pointer being off scale below 0%.



SPILL INCHING SWITCH (4)

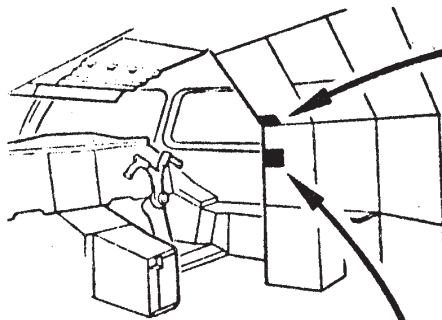
Enables the spill door to be opened and shut providing the RAMP/SPILL MASTER switch is at MAN and hydraulic pressure is available. It is spring returned to the centre position.

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CONCORDE FLYING MANUAL

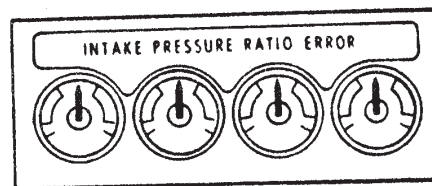
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INTAKE CONTROLS AND INDICATORS (Sheet 2 of 3)



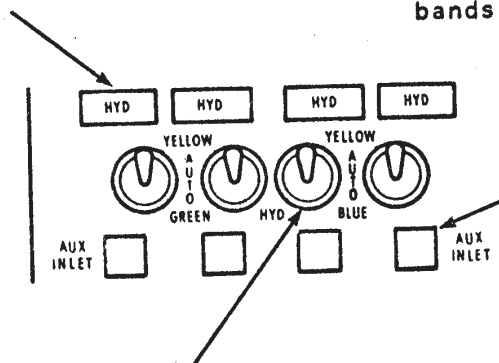
HYD LIGHT (Amber) (4)

On - indicates a failure of the hydraulic actuation of the intake.
Accompanied by a MWS INT (Amber)



INTAKE PRESSURE RATIO ERROR INSTRUMENT (4)

Shows the intake status at aircraft speeds above $M=1.3$ following an intake control failure, the pointer shows the direction in which the throttle lever is to be moved to obtain intake - engine matching. If the pointer lies in the left amber band the throttle lever must be retarded, if the pointer lies in the right amber band the throttle lever must be advanced. Correct intake - engine matching is indicated when pointer is between amber bands.



AUX INLET MI (4)



HYDRAULIC SELECTOR (4)

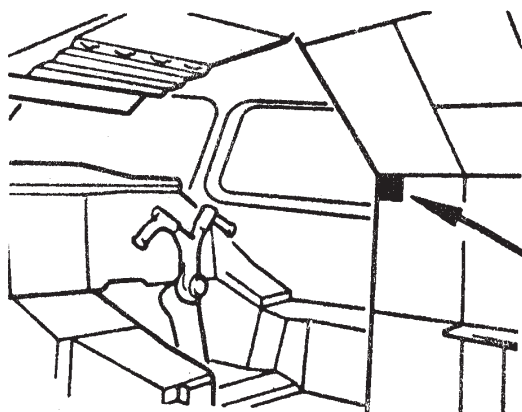
YELLOW - the yellow hydraulic system is selected to supply the intake and the yellow hydraulic pumps are onloaded.

AUTO - the main hydraulic operating system for each intake is selected and the automatic changeover facilities are armed. The automatic changeover will occur when a failure of the main hydraulic operation or a low level in a main hydraulic reservoir is sensed.

NOTE: At both yellow and auto the cut-off of yellow hydraulic system supply to the spill door actuators will occur when the second low level in the yellow hydraulic system is sensed.

GREEN AND BLUE - selected the appropriate hydraulic system with no automatic changeover facility.

INTAKE CONTROLS AND INDICATORS
(Sheet 3 of 3)



α LIGHT (Amber)

On - indicates a failure of the aircraft incidence signal of one or more of the intake control units in use.
Accompanied by MWS INT() (amber)

N_1 SIG LIGHT (Amber) (4)

On - indicates a failure of the LP spool speed signal to the intake control unit in use.
Accompanied by a MWS INT (amber)

INTAKE LIGHT (Red) (4)

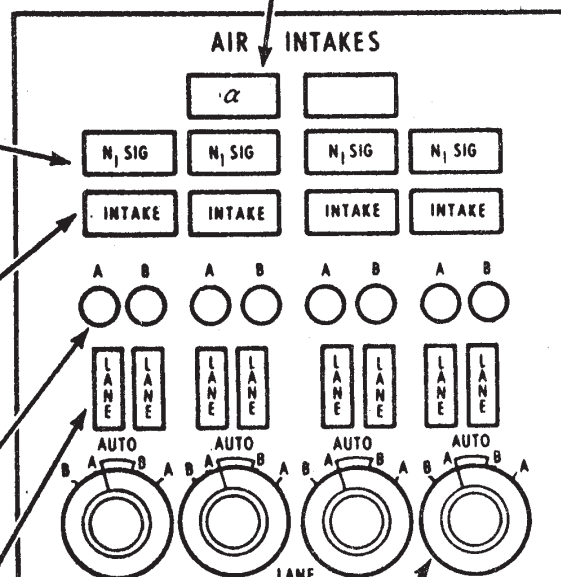
On - indicates that the air intake ramp and spill doors are not under the control of the air intake automatic control system.
Accompanied by a MWS INT (red)

LANE IN USE LIGHT
(Green) A(4) AND B(4)

On - indicates the lane controlling the intake.

LANE LIGHT (Amber) (8)

On - indicates a failure of the associated intake lane A or B, whether it is in use or not.
Accompanied by the MWS INT (amber)



LANE ROTARY SELECTOR (4)

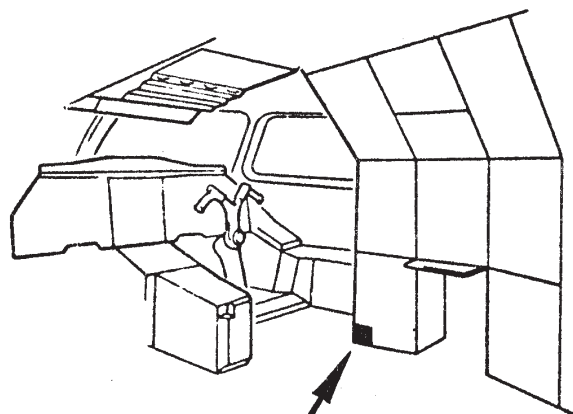
There are two identical control lanes per intake identified as A and B. Either may be used as the first selection. With AUTO A or AUTO B selected failure of the lane causes automatic change-over to the other lane. The non-auto positions A and B are selections of the appropriate lane with no auto-change capability.

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CONCORDE FLYING MANUAL

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INTAKE TEST AND FAULT IDENTIFICATION (Sheet 1 of 2)



INTAKE TEST ON LIGHT (Red)

On - when the test master switch is operated. It is accompanied by the MWS INT (red)

INTAKE TEST LIGHT (7)

INTAKE TEST RESET SWITCH

Spring returned to OFF.
When electrical power is removed from the air intake systems random indication of failure may be latched on. When electrical power is re-established, setting the INTAKE TEST RESET switch to RESET, resets the system and removes false warnings from the panel.

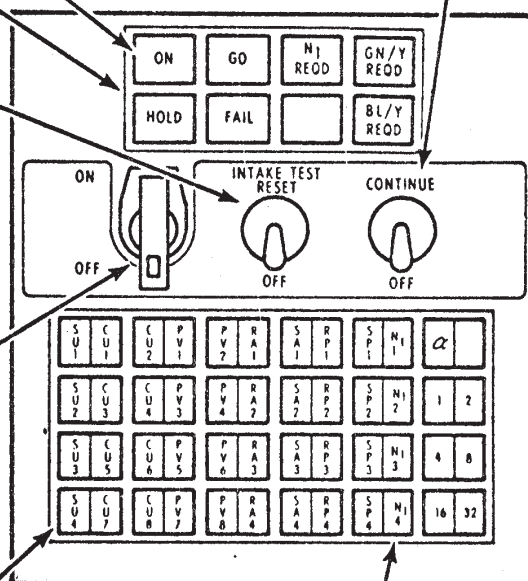
INTAKE TEST MASTER SWITCH

CAUTION: MUST NOT BE MOVED FROM ITS GUARDED OFF POSITION IN FLIGHT

FAULT IDENTIFICATION LIGHT (White) (47)

Used to identify line replacement units (LRU) in the air intake control systems when they have failed. The lights indicate failure during test or normal operation of the intakes.

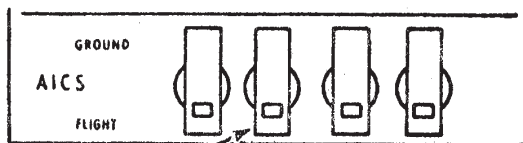
INTAKE TEST CONTINUE SWITCH
Spring returned to OFF.



N₁ FAULT IDENTIFICATION LIGHT (White) (4)

On - indicates that there is no LP spool speed signal to the air intake control systems.

INTAKE TEST AND FAULT IDENTIFICATION
(Sheet 2 of 2)

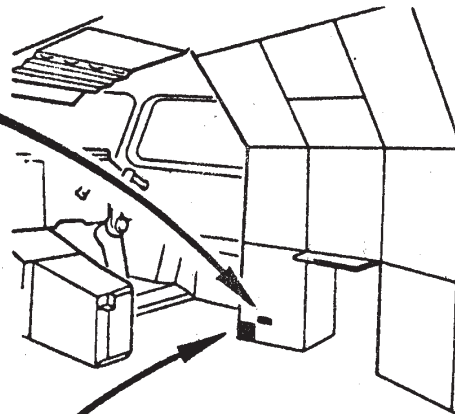


AICS GROUND/FLIGHT SWITCHES (4)

GROUND - in conjunction with the INTAKE TEST panel enables the air intakes to be tested.

FLIGHT - inhibits the INTAKE TEST function

NOTE: If any one switch is set to GROUND, all 4 MWS INT (red) will operate.

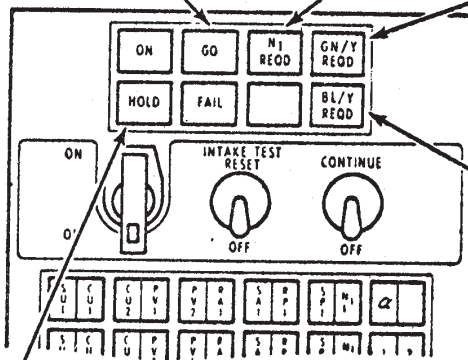


INTAKE TEST GO LIGHT
(Green)

On - indicates a successful test of the air intake system and deselection of the intake test switch.

INTAKE TEST N₁ REQD
LIGHT (Yellow)

On - indicates no N₁ signal to air intake test unit.



INTAKE TEST GN/Y REQD LIGHT
(Yellow)

On - indicates a change required to setting of ground hydraulic check out panel to enable air intake test to be performed.

INTAKE TEST BL/Y REQD LIGHT
(Yellow)

On - indicates a change required to setting of ground hydraulic check out panel to enable air intake test to be performed.

INTAKE TEST HOLD LIGHT
(Yellow)

On - 7 secs after setting the INTAKE TEST master switch to ON, providing the RAMP/SPILL master switch is at MAN indicates a successful self test of the intake test unit circuits.

INTAKE TEST FAIL
LIGHT (Red)

On - indicates an unsuccessful air intake test.

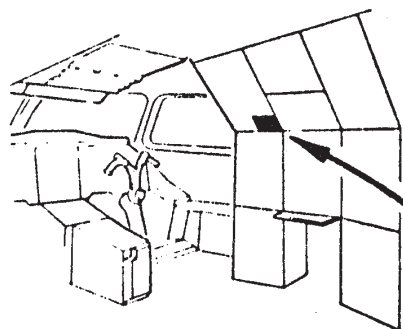
SECONDARY AIR DOORS AND NOZZLES

SECONDARY AIR DOOR SELECTOR (4)

AUTO - opening of the secondary air doors is controlled by ADC signals. The doors for engines 1, 2 and 3 are opened at speeds in excess of $M = 0.26$ and those of engine 4 at speeds in excess of 220 knots.

- closing of the secondary air doors of engine 4 is by ADC signal at speeds less than $M = 0.26$ providing that the landing gear is down and those of engines 1, 2 and 3 on touch down, via weight switches, providing that the speed is less than $M = 0.26$.

The AUTO position may be overridden by selection of OPEN or SHUT.



SECONDARY NOZZLE INSTRUMENT (4)

Shows the secondary nozzle bucket position within the range 0-37.5 deg. When the buckets are being used as thrust reversers the instrument pointer is hidden behind the mask. Loss of electrical power supply to the instrument is indicated by the pointer being off scale 0 deg end.

FLIGHT REV ARM PUSH BUTTON

Pressed - opens the air supply isolation valve between engines 1 and 2 and the air supply isolation valve between engines 3 and 4 and providing the four throttle levers are at idle, arms the flight reverse system.

The button is magnetically held in the armed position. When any of the throttle levers is advanced more than 10% from idle the magnetic latch of the FLIGHT REV ARM push button is released disarming the in-flight reverse system, which causes the air supply isolation valves to shut.

FLIGHT REV ARM OPEN LIGHT (Blue)

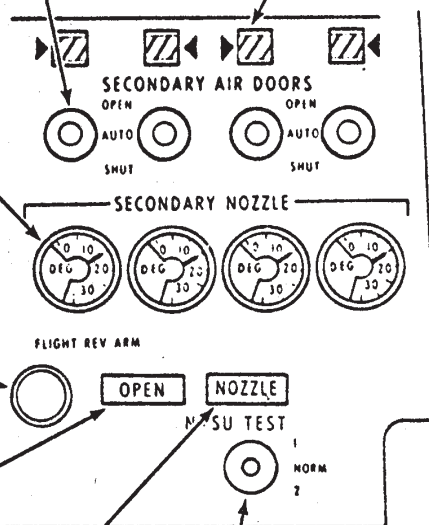
On - indicates that at least one of the two air supply isolation valves is open.

NOZZLE LIGHT (Yellow)

On - indicates a loss of one or both NASUs, or, that FLYOVER engine schedule is selected above $M = 1.0$

SECONDARY AIR DOOR MI (4)

OPEN SHUT

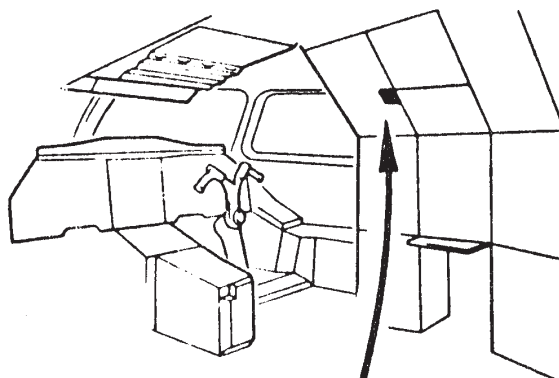


NOZZLE ANGLE SCHEDULING UNIT (NASU) TEST SELECTOR

- 1 - the failure detection circuits of No 1 NASU system are being tested.
- 2 - the failure detection circuits of No 2 NASU system are being tested.

ENGINE CONTROL SCHEDULE

(Sheet 1 of 2)

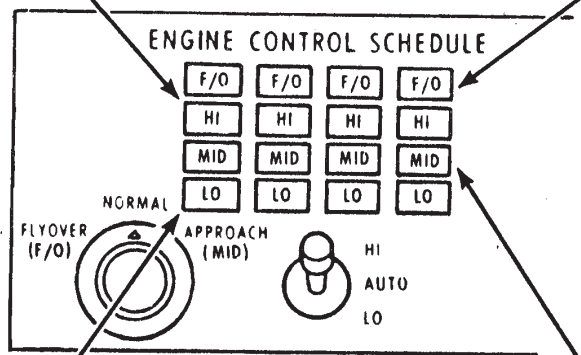


ENGINE CONTROL SCHEDULE
HI LIGHT (White) (4)

On - indicates that the
high ENGINE CONTROL
SCHEDULE is operating.

ENGINE CONTROL SCHEDULE
F/O LIGHT (White) (4)

On - indicates that the
flyover ENGINE CONTROL
SCHEDULE is operating.



ENGINE CONTROL SCHEDULE
LO LIGHT (Green) (4)

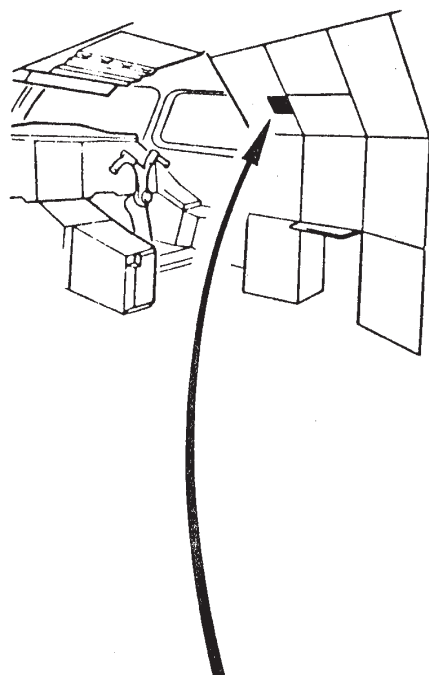
On - indicates that the low
ENGINE CONTROL SCHEDULE
is operating.

ENGINE CONTROL SCHEDULE
MID LIGHT (White) (4)

On - indicates that the mid
ENGINE CONTROL SCHEDULE is
operating.

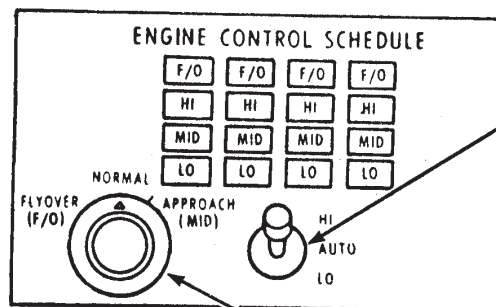
(Unchanged)

ENGINE CONTROL SCHEDULE
(Sheet 2 of 2)



ENGINE CONTROL SCHEDULE
SELECTOR (ALL ENGINES)

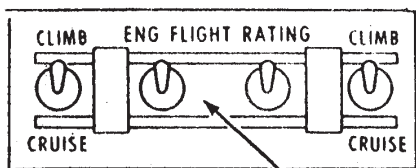
- HI** - selects the high engine control schedule once the conditions demanding an alternative engine control schedule no longer exist; these conditions are; with the landing gear down the controlling schedule will be LO (low). With the landing gear up, the ENG RATING MODE switch at TAKE OFF and reheat selector at RHT, the controlling schedule will be LO (low). With the landing gear up, the ENG RATING MODE switch at FLIGHT and reheat selector at RHT, the controlling schedule will be MID.
- AUTO** - allows the selection of engine control schedule using the rotary selector.
- LO** - selects the low ENGINE CONTROL SCHEDULE



ENGINE CONTROL SCHEDULE ROTARY SELECTOR

- AT ANY POSITION EXCEPT MID (APPROACH)** - with the aircraft on the ground, or flying at a speed less than 220 knots, or during reheat operation with the ENG RATING MODE switch at TAKE OFF, and the ENGINE CONTROL SCHEDULE selector at AUTO selects the low engine control schedule.
- NORMAL** - with the aircraft speed greater than 220 knots, reheat cancelled and the ENGINE CONTROL SCHEDULE at AUTO selects the high engine control schedule.
- with the aircraft speed greater than 220 knots, the ENG FLIGHT RATING switch at CLIMB, the ENG RATING MODE switch at FLIGHT, reheat operating and the ENGINE CONTROL SCHEDULE selector at AUTO selects the mid engine control schedule.
- FLYOVER (F/O)** - with the aircraft speed greater than 220 knots, but less than $M = 1.0$, reheat cancelled, and the ENGINE CONTROL SCHEDULE selector at AUTO selects the flyover engine control schedule.
- with the aircraft speed greater than $M = 1.0$, reheat cancelled, and the ENGINE CONTROL SCHEDULE selector at AUTO selects the high engine control schedule.
- APPROACH (MID)** - providing the ENGINE CONTROL SCHEDULE selector is at AUTO the mid engine control schedule is selected except when aircraft on the ground.

THROTTLE AND IGNITION SWITCHES



ENG FLIGHT RATING SWITCH (4)

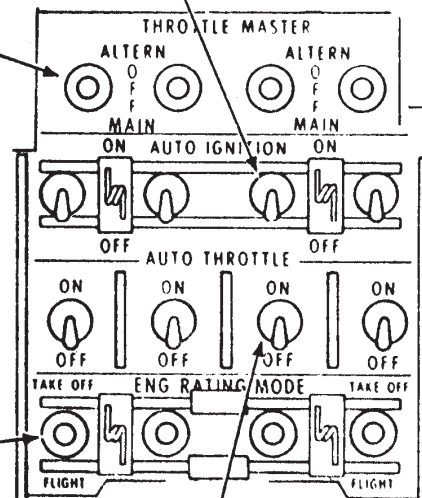
- CLIMB** - providing the ENG RATING MODE switch is at FLIGHT, the engine N₁, N₂ and EGT will be limited to the climb rating.
- CRUISE** - providing the ENGINE RATING MODE switch is at FLIGHT, the engine N₁, N₂ EGT will be limited to the cruise rating.

THROTTLE MASTER SELECTOR AND LIGHT (Red) (4)

ALTERN - the engine is being controlled OR by one of two identical throttle MAIN control systems.
Light in selector on - indicates that the selected throttle control system has failed.

NOTE: The light is inhibited when the HP VALVE switch is at SHUT and the THROTTLE MASTER selector is at OFF.

AUTO IGNITION SWITCH (4)
ON - the auto ignition system is armed.



ENG RATING MODE SWITCH (4)

TAKE OFF - the engine N₁, N₂ and EGT will be limited to the take-off rating and the contingency is armed.

FLIGHT - the ENGINE FLIGHT ratings are armed.

NOTE: When the main landing gears are locked down the magnetic latches that hold the ENG RATING MODE switches in the FLIGHT position are released, and the switches are spring returned to the TAKE OFF position. Engine 1 and 4 switches are released by the left gear and those for engines 2 and 3 by the right gear.

AUTO THROTTLE SWITCH (4)

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THROTTLE CONTROL AND REHEAT SELECTORS

CTY (contingency) LIGHT (Yellow)

On - indicates that at least one of the four reheat selectors is at CTY.

On flashing - indicates automatic selection of contingency rating.

T/O (take off) LIGHT (White)

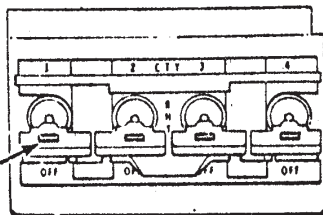
On - indicates that at least one of the four ENG RATING MODE switches is at TAKE OFF.

CLB (climb) LIGHT (White)

On - indicates that at least one of the four ENG FLIGHT RATING switches is at CLIMB and its associated ENG RATING MODE switch is at FLIGHT.

CRS (cruise) LIGHT (White)

On - indicates that at least one of the ENG FLIGHT RATING switches is at CRUISE and its associated ENG RATING MODE switch is at FLIGHT.



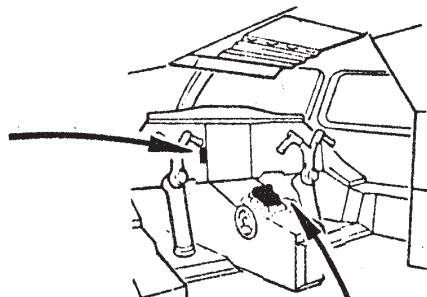
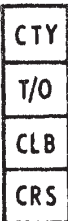
REHEAT SELECTOR (4)

CTY (contingency) - provided the ENG RATING MODE switch is at TAKE OFF the engine N₂ and EGT will be limited to the contingency rating.

RHT (REHEAT) - Take-off: arms the reheat circuits and CON lights and providing the TAKE OFF MONITOR button has been pressed, the auto selection of contingency rating is armed.

Transonic: arms the reheat circuits and CON light and providing the ENG RATING MODE switch is at FLIGHT, the mid engine control schedule is armed.

OFF - stops the reheat fuel flow, disarms auto selection of contingency rating, and providing the engine control schedule selectors are at FLYOVER and AUTO the flyover engine control schedule is armed.

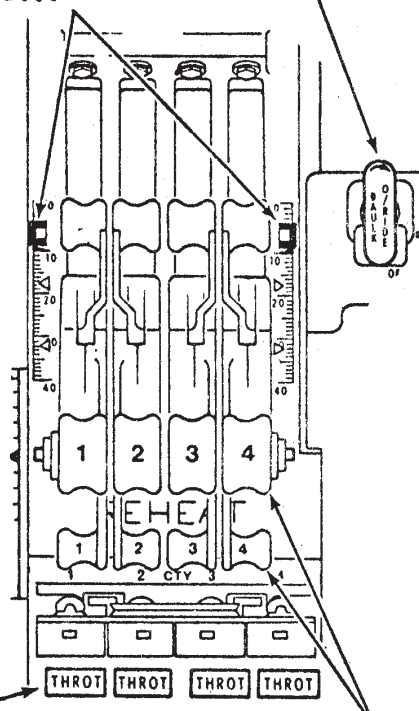


BAULK O/RIDE HANDLE

Lifting and turning clockwise releases the forward baulk of the reverse thrust levers, enabling them to be moved to their fully down position.

THROTTLE LEVER ANGLE INDICES

The index is in the form of a light which is set against a scale.



THROTTLE LEVER (4)

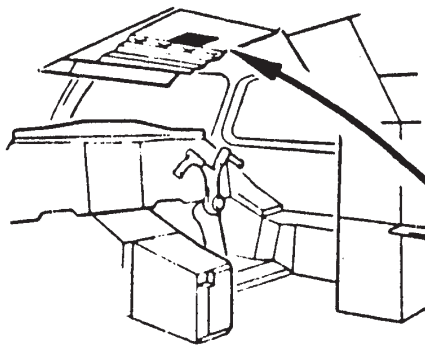
THROT LIGHT (Red) (4)

On - indicates that the selected throttle control system has failed.

Accompanied by a MWS THROT (red) and the associated THROTTLE MASTER selector light (red). Pressed - tests the light and its connections to the MWS and THROTTLE MASTER lighted switch.

NOTE: The light is inhibited when the HP valve switch is at SHUT and the THROTTLE MASTER selector is at OFF.

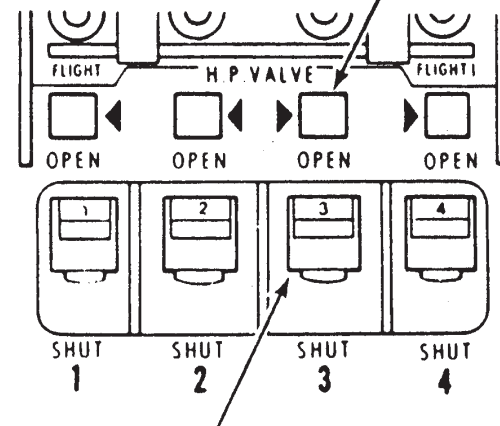
HP VALVE SWITCHES



HP VALVE MI (4)

OPEN

SHUT



HP VALVE SWITCH AND LIGHT (White) (4)

SHUT - the valve stops the high pressure fuel flow to the engine. This position regardless of the following systems switch positions:-

Opens the engine recirculation valves.

Inhibits the engine igniters.

Inhibits the engine T₁ probe heater.

Inhibits the THROT fail lights if the THROTTLE MASTER SELECTOR is at OFF.

Reduces public address volume if all other HP VALVE switches are at SHUT.

Cancels its own switch light if it is on.

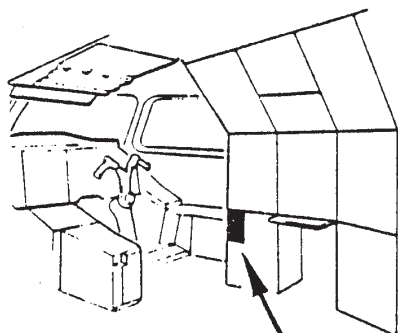
Inhibits the engine shut-down handle lights except during engine fire warnings.

Light in switch on - indicates the associated engine shut down handle is pulled.

(Unchanged)

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ENGINE START AND RELIGHT



RELIGHT/START SELECTOR (4)

Master selector for engine starting.

RELIGHT - providing the throttle lever is at idle and the HP VALVE switch is at OPEN, the start electrical fuel pump will run and both engine igniters will be energized irrespective of the ignition selector position.

NOTE: With only the essential busbars (4) operating only the left hand igniter is powered.

START - opens an air valve to allow air to turn the engine via an air starter. It also energizes the start fuel pump and allows selective ignition through the ignition rotary selector. The selector is magnetically held at START until 25% N₂ then it returns to OFF. The magnetic latch can be overridden by setting the selector to OFF.

START VALVE MI (4)

OPEN SHUT

ENGINE DEBOW SWITCH AND LIGHT (Yellow) (4)

NORMAL - N₂ will automatically rise to clear compressor rotating stall speeds and drop to idle.

DEBOW - during starting the HP spool (N₂) r.p.m. is kept below normal idle until the HP spool shaft temperature is constant around its circumference ensuring the shaft rotates true. Switch light on indicates that the switch is set at DEBOW and that the engine is not in the DEBOW condition, or, that the 60 secs DEBOW cycle has been completed.

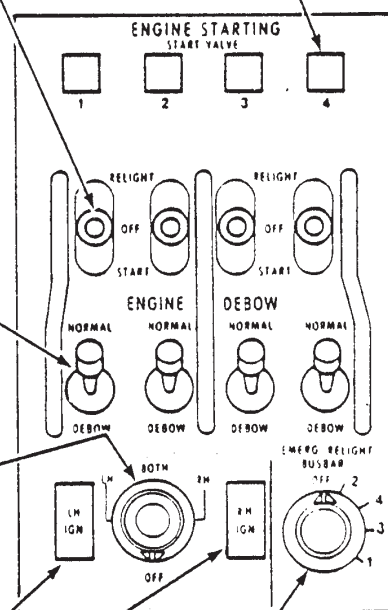
IGNITION ROTARY SELECTOR

BOTH - igniters used together.
LH - LH igniter only operating
RH - RH igniter only operating

NOTE: The ignition system is inhibited until the HP valve switch is set to OPEN.

LH and RH IGN LIGHT (Green)

On - indicates that the selected system(s) is/are energized.

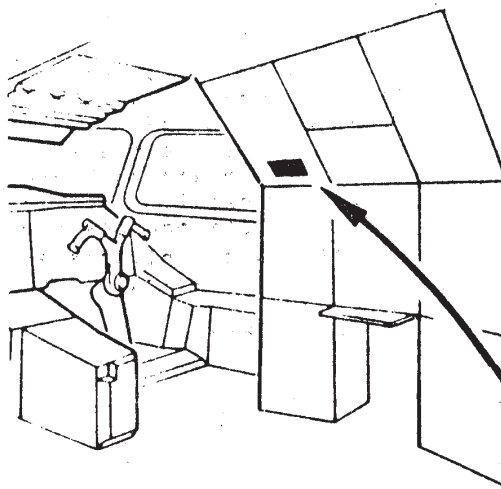


EMERG. RELIGHT BUSBAR ROTARY SELECTOR

2 - the emergency generator powers the emergency relight busbar 25X to operate the right hand igniter, the start pump and the main engine feed pump of collector tank 2.

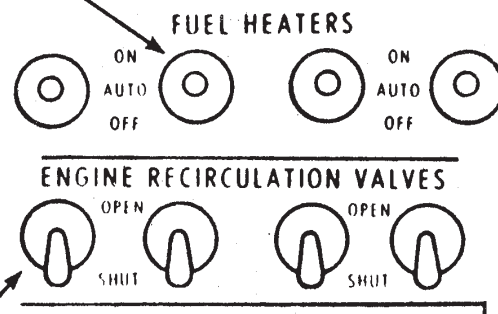
4,3,1 - the emergency generator powers the emergency relight busbars 27X, 26X and 24X respectively.

FUEL HEATING AND RECIRCULATION



FUEL HEATERS SELECTOR (4)

- ON** - AUTO position overridden and the heater is supplied with hot air.
- AUTO** - the fuel heater is supplied with hot air when the fuel inlet temperature is less than plus 5 deg C. There is no positive indication of operation.



ENGINE RECIRCULATION VALVES SWITCH (4)

- OPEN** - the recirculation valves allow the recirculation of fuel from downstream of the engine and CSD oil coolers back to the engine feed tanks. This maintains the cooling flow of fuel across these coolers when engine feed flow is reduced by the engine's low demand for fuel.
- SHUT** - recirculation of the fuel back to the collector tanks is stopped.

NOTE: The recirculation valve is opened automatically when the associated engine shut down handle is pulled or the associated HP VALVE switch is set to SHUT irrespective of the ENGINE RECIRCULATION VALVES switch position.

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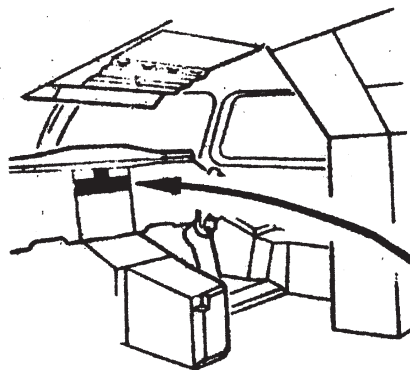
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TAKE OFF MONITOR AND PRIMARY INDICATION

TAKE-OFF MONITOR CONTROL BUTTON

PUSH ARM - arms the clear to go (green) lights for monitoring, the engine thrust during the take off run, and providing the reheat selector is at RHT arms the autoselection of the engine contingency rating

PULL INHIB - disarms the clear to go (green) lights and the auto selection of the engine contingency rating.



POWER MANAGEMENT LIGHTS

Clear to go light (Green) (4)

CON (configuration) light (Amber) (4)

REV (reverse) light (Blue) (4)

Clear to go light on - indicates that the secondary nozzle buckets are positioned within limits, the CON light is off and the set bug values of P₇ and FUEL FLOW have been achieved, and the ENG 4 T/O N₁ LIMITER has returned to NORMAL position.

CON light on - with no decrease in N₂, indicates loss of reheat thrust.

CON light on - with REVERSE selected indicates that the primary nozzle is greater than 15%.

REV light flashing - indicates that the buckets are in transit.
REV light on - indicates that the buckets are closed.
REV light off - indicates that the buckets are within the forward thrust range.

DIGITAL COUNTER

FLAG

OVERLIMIT POINTER

N₂ INSTRUMENT (4)

Indicates a percentage rpm of the high pressure spool on the dial scale and digital counter.
The instrument incorporates an overlimit pointer which remains at 110% or the highest value the main pointer has indicated until it is reset. Loss of electric power supply to the instrument is shown by a red and black striped flag across the digital counter.

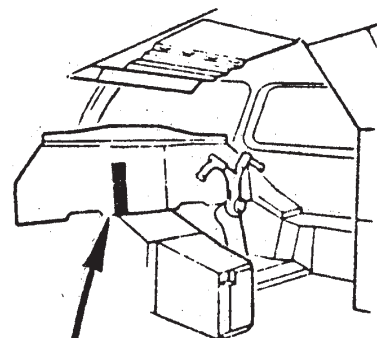
PRIMARY INDICATION (Sheet 1 of 2)

N₁ INSTRUMENT (4)

Indicates a percentage rpm of the low pressure spool on the dial scale and digital counter.

It incorporates an overlimit pointer which remains at 108.5% or the highest value the main pointer has indicated until it is reset.

Loss of electric power supply to the instrument is shown by a red and black striped flag across the digital counter.

**N₁ REDUCE LIGHT (Amber)**

On - indicates that the affected intake is operating supercritically and the propulsion unit is not operating at optimum efficiency. Accompanied by a MWS INT (amber)

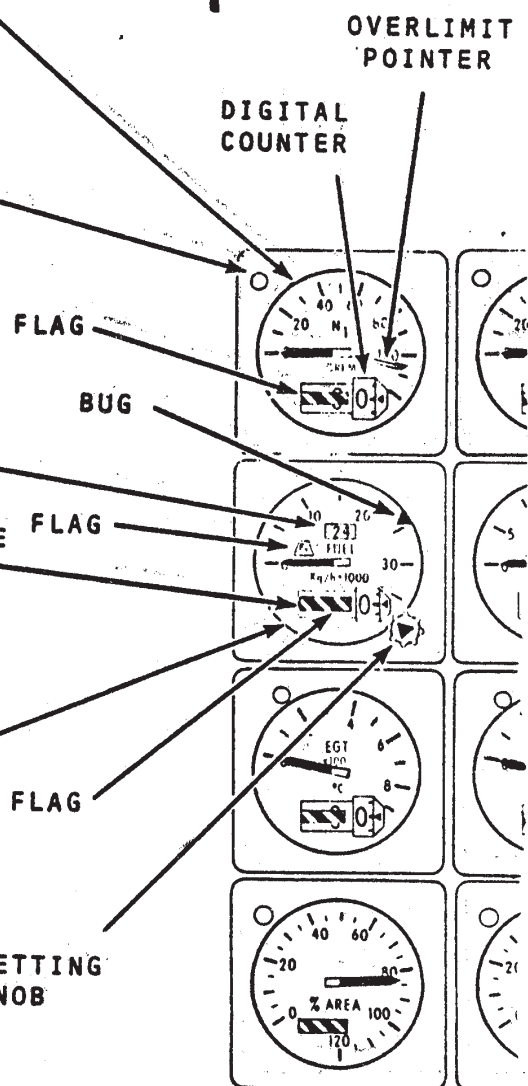
UPPER DIGITAL COUNTER**LOWER DIGITAL COUNTER****FUEL FLOW INSTRUMENT (4)**

Indicates the fuel flow rate in kg/hr x 1000 on the dial scale and lower digital counter.

The instrument F_T/F_E flag shows F_E when fuel flow to the reheat system has reduced to less than 330 kg/hr. It shows F_T when the fuel flow to the reheat system has increased to greater than 680 kg/hr.

The setting knob adjusts the bug and upper digital counter to the required take-off value.

The bug setting also forms part of the take-off monitoring system. Loss of electrical power supply to the instrument is shown by a red and black striped flag across the lower digital counter.

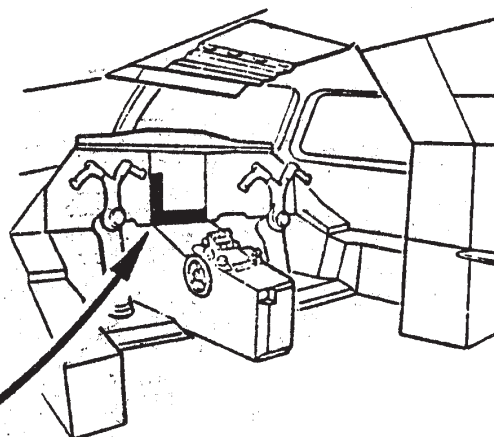


PRIMARY INDICATION

(Sheet 2 of 2)

EXHAUST GAS TEMPERATURE (EGT)
GAUGE (4)

Indicates the gas temperature in the jet pipe on the dial scale and digital counter. Loss of electric power supply to the gauge is shown by a red and black striped flag across the digital counter. Loss of EGT information to the gauge is shown by the pointer being at 0°. At a temperature colder than -50°C at the EGT thermocouple, the EGT gauge pointer will indicate 0° and the striped flag will appear across the digital counter.



WARNING LIGHT (Yellow)

On - indicates the loss of EGT information to the selected throttle control system.

REHEAT SELECTED LIGHT (White)

On - indicates that the reheat selector is away from the OFF position

DIGITAL COUNTER

ADDITIONAL YELLOW SECTOR (Engine No.4 only)

Indicates correct reheat operation below 60 kts. Range 60-70%.

FLAG

FLAG

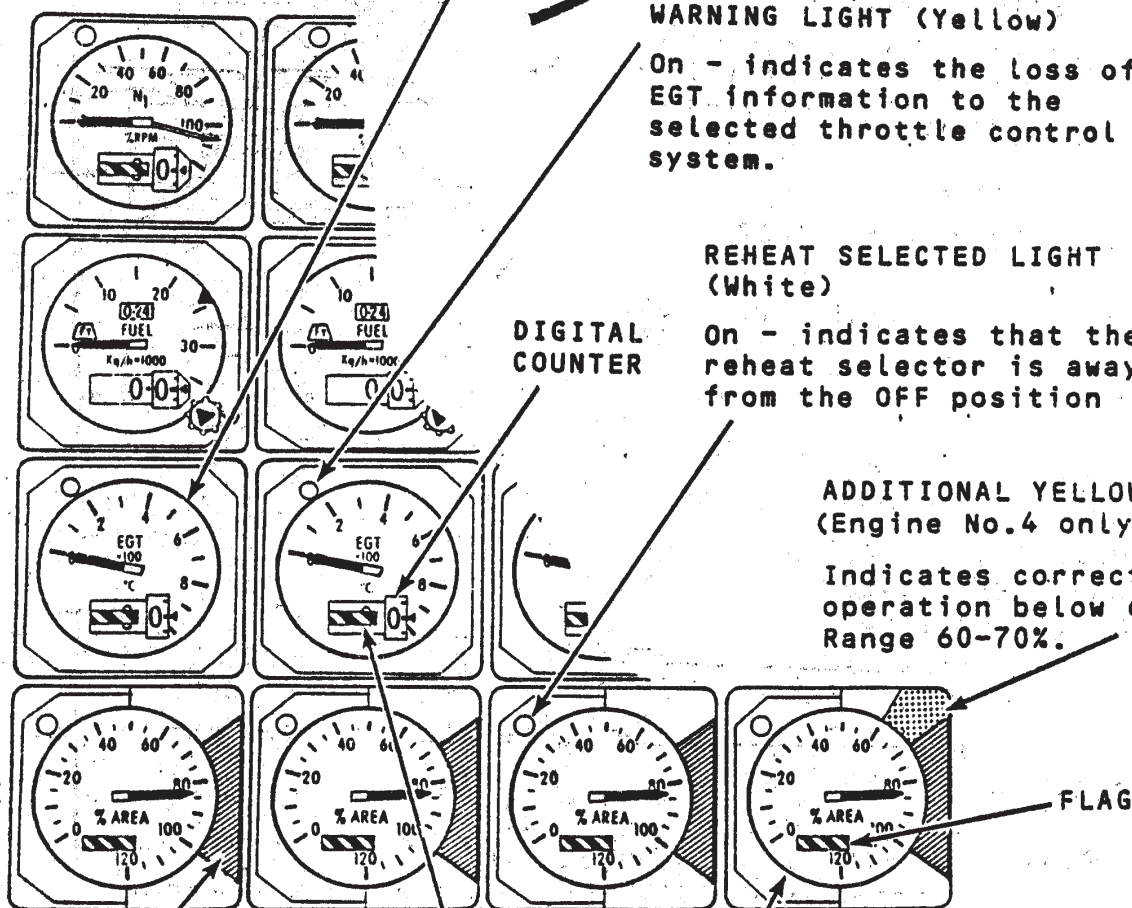
WHITE SECTOR (on each instrument)

Indicates correct reheat operation, Range 70-100% all engines.

AREA INSTRUMENT (4)

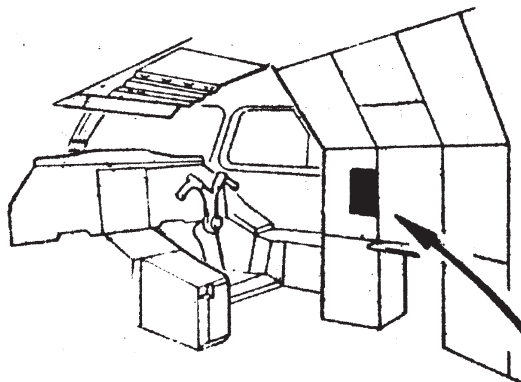
Indicates the primary nozzle exhaust gas discharge area as a percentage of the range between minimum and maximum area.

Loss of electric power supply to the instrument is shown by a red and black striped flag.



ENGINE INSTRUMENTS

(Sheet 1 of 2)



TCA HIGH TEMP LIGHT (Red)

On - indicates that a high temperature exists in the turbine cooling air system. Accompanied by a MWS ENG light (red), an engine shut down handle light (red) and audio (gong)

TURBINE COOLING AIR (TCA) TEMP INSTRUMENT (4)

Shows the temperature of the cooling air after it has passed across the face of the HP turbine.

FUEL TEMP INSTRUMENT (4)

Shows the temperature of the fuel at the fuel burner manifold.

FUEL HIGH TEMP LIGHT (Amber)

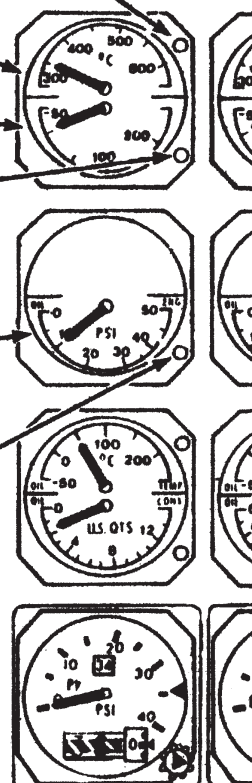
On - indicates that a high fuel temperature exists in the fuel burner manifold. Accompanied by a MWS ENG light (amber) and audio (gong).

OIL ENG INSTRUMENT (4)

Shows the pressure in the engine oil system.

OIL ENG LOW PRESSURE LIGHT (Red)

On - indicates that the oil pressure is less than 15 psi. Accompanied by a MWS ENG light (red), an engine shut down handle light (red) and audio (gong).

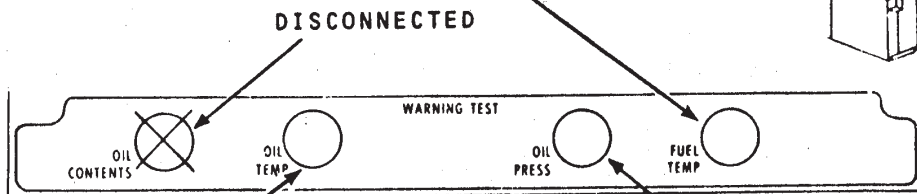


ENGINE INSTRUMENTS

(Sheet 2 of 2)

FUEL TEMP WARNING TEST PUSH BUTTON

Pressed - tests the high fuel temperature warning lights and their connections to the MWS.



OIL TEMP WARNING TEST PUSH BUTTON

Pressed - tests the high oil temperature warning lights and their connections to the MWS.

OIL PRESS WARNING TEST PUSH BUTTON

Pressed - with engines running tests the low oil pressure warning lights and their connections to the MWS.

OIL TEMP INSTRUMENT WARNING LIGHT (Amber)

On - indicates that a high temperature exists in the engine oil entering the oil pressure pump.
Accompanied by MWS ENG light (amber) and audio (gong).

OIL TEMP INSTRUMENT (4)

Shows the temperature of the engine oil entering the oil pressure pump.

OIL CONT INSTRUMENT (4)

Shows the content in the engine oil tank.

OIL CONT INSTRUMENT WARNING LIGHT (Yellow).

On - indicates that the content of the engine oil tank is greater than 14 U.S quarts.

P7 INSTRUMENT (4)

Shows the pressure in the jet pipe. The setting knob adjusts the bug and upper digital counter to the required take-off value. The bug setting also forms part of the take-off monitoring system. A red and black striped flag across the lower digital counter shows loss of electrical power supply or failure of the instrument servo system.

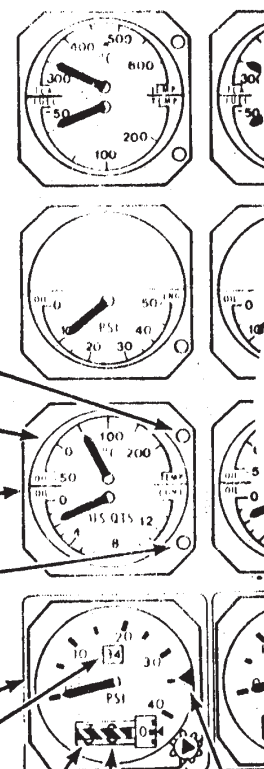
UPPER
DIGITAL
COUNTER

FLAG

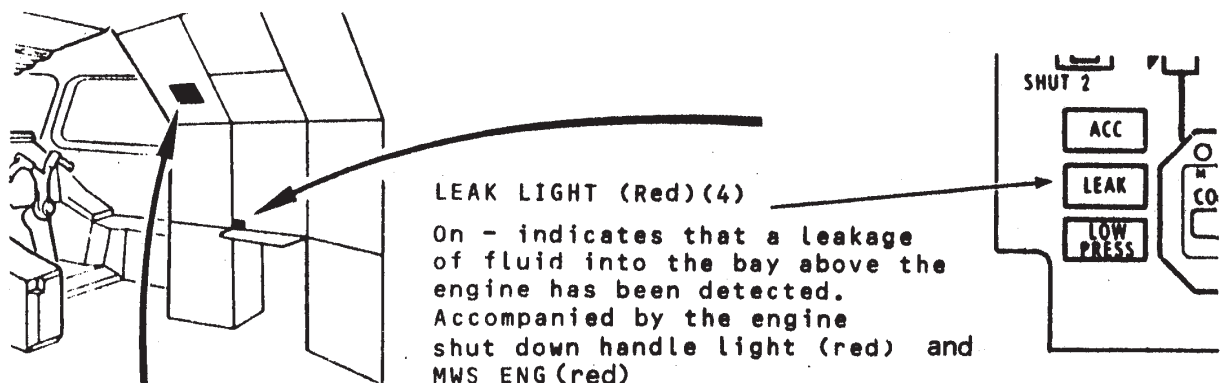
BUG

SETTING
KNOB

LOWER
DIGITAL
COUNTER

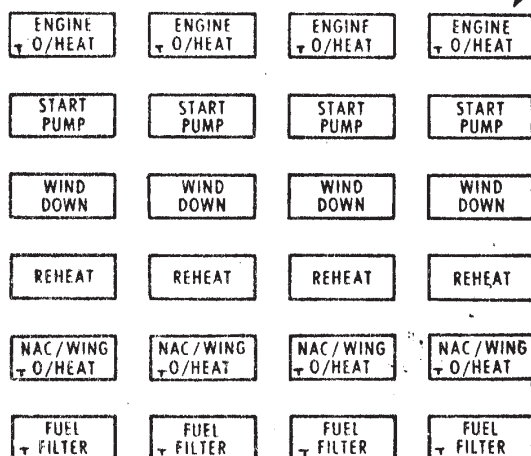


ENGINE WARNING LIGHTS



ENGINE O/HEAT LIGHT (Red) (4)
Refer to FIRE PROTECTION

START PUMP LIGHT (Yellow) (4)
On - indicates that an electrically driven fuel start pump is running.



WIND DOWN LIGHT (Yellow) (4)
On - indicates that the wind down system has operated.

REHEAT FAULT LIGHT (Yellow) (4)

On - indicates a fault in the reheat system.

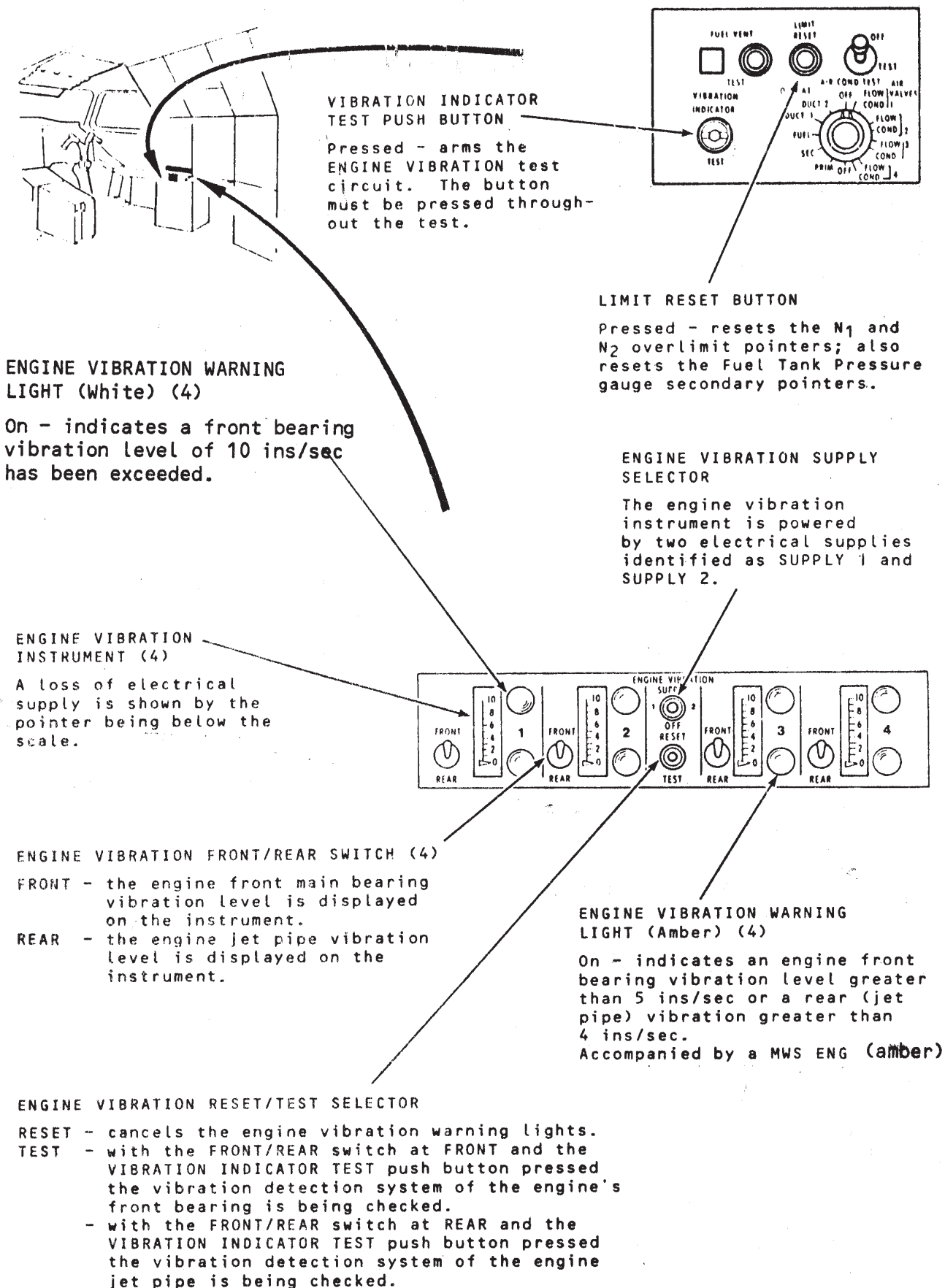
FUEL FILTER LIGHT (Amber) (4)
On - indicates an excess differential pressure across the engine fuel filter. Accompanied by a MWS ENG (amber)

NAC/WING O/HEAT LIGHT (Amber) (4)
Refer to FIRE PROTECTION

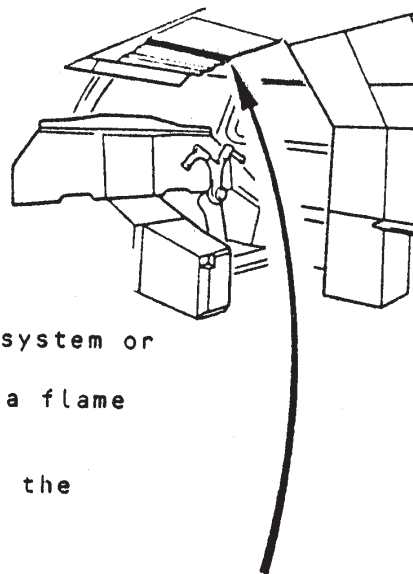
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ENGINE VIBRATION



EMERGENCY SHUT DOWN

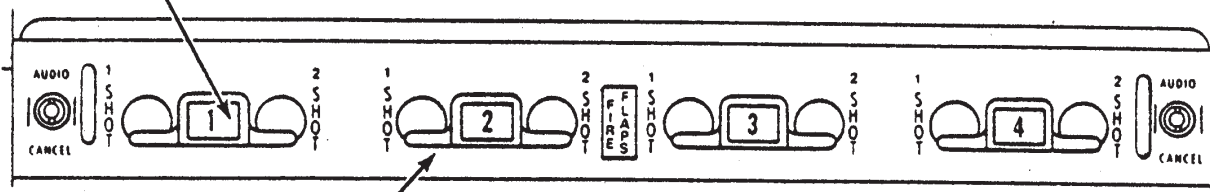


ENGINE SHUT DOWN HANDLE LIGHT (Red) (4)

On steady - indicates:

high temperature in the engine cooling air system or low pressure in the engine oil system or an overheat condition within the engine or a flame breakout from the combustion chamber or a fluid leak into the bay above an engine.

NOTE: At SHUT the HP VALVE switch inhibits the engine shut down handle light except during engine fire warnings.



ENGINE SHUT DOWN HANDLE. (4)

Pulling the engine shut down handle when its light is on steady cancels the light and:

Shuts the HP VALVE.

Switches the HP VALVE switch light (white) on.

Shuts the LP VALVE.

Shuts the hydraulic SHUT OFF VALVE(S).

Shuts the reheat fuel shut off valve.

Shuts the air BLEED VALVE.

Shuts the air CROSS BLEED valves.

Shuts the cabin inlet safety valve.

Shuts the SECONDARY AIR DOORS and engine bay vent thus causing the FIRE FLAPS light (green) to come on.

Onloads the standby (yellow) hydraulic system pumps.

Opens the ENGINE RECIRCULATION VALVE.

Inhibits the engine igniters.

Inhibits the T₁ ENGINE PROBE HEATER thus causing the T₁ light (yellow) to come on.

NOTE : The triangle (orange) next to the following MIs:

HP VALVE.

LP VALVE.

Hydraulic SHUT OFF VALVE.

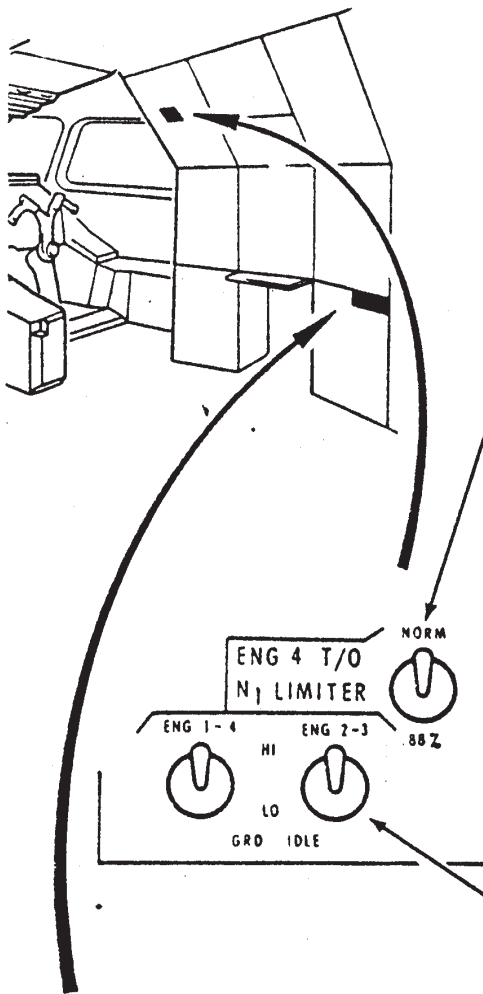
Air BLEED VALVE.

Air CROSS BLEED.

SECONDARY AIR DOORS

indicates that the associated valves and doors are shut by pulling the engine shut down handle.

NOZZLE AIR SOV & WIND DOWN TEST AND
GROUND CONTROL SWITCHES



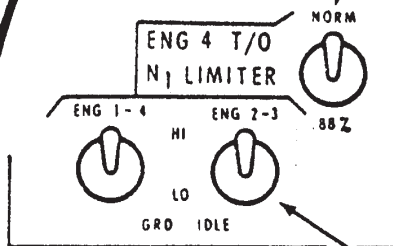
ENG 4 T/O N₁ LIMITER SWITCH

NORM - engine control is normal.

88% - the N₁ of number 4 engine is limited to a maximum value of 88%. This is necessary because air-flow patterns within number 4 intake below 60 knots with the N₁ above 88% causes airflow distortion at the engine face leading to LP compressor blade vibration. 88% is magnetically latched at speeds below 60 knots.

With the switch at 88% the GO lt for No. 4 engine is inhibited.

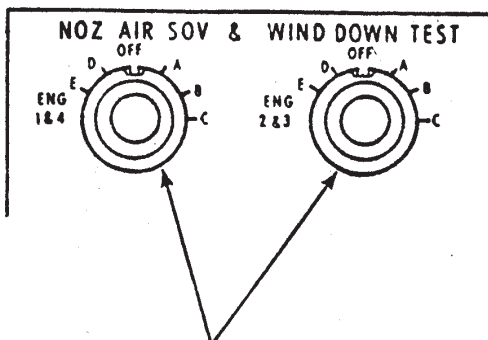
At temperatures colder than -35°C. the eng 4 T/O N₁ LIMITER will have no effect on engine 4 since the engine control schedule will limit the N₁ of all engines to 88% or less.



GRD IDLE SWITCH (2)

HI - fuel flow is normal.

LO - fuel flow to the engine is reduced thereby enabling lower engine thrust to be obtained for use during taxiing. LO is magnetically latched at speeds below 60 knots.



NOZ AIR SOV & WIND DOWN TEST ROTARY SELECTOR

- A - Not used by aircrew.
- B - Checks the control switch that triggers the wind down system should inadvertent forward thrust occur.
- C - Not used by aircrew.
- D - Not used by aircrew.
- E - Checks the operation of the air shut-off valve.

(Unchanged)

SCHEMATIC LAYOUT

